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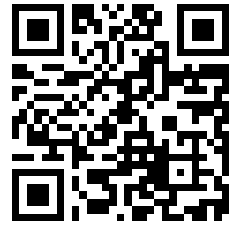

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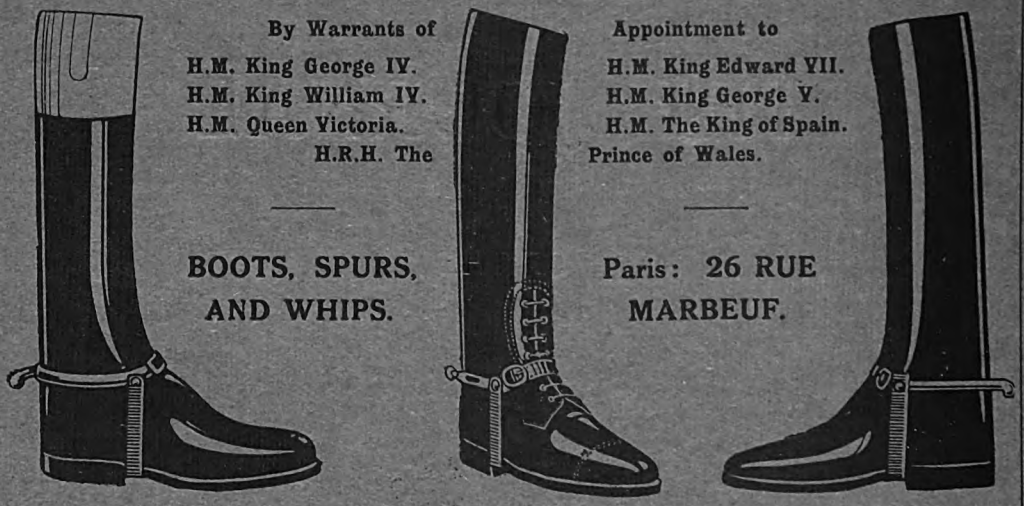

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GENERAL LORD RAWLINSON, G.C.B., G.C.V.O., K.C.M.G., A.D.C., Commander Fourth Army.

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CURRENT NAVAL PROBLEMS.

A Lecture delivered at the Royal Artillery Institution, Tuesday, 18th December, 1928.

By Captain B. H. Ramsay, M.V.O., R.N.

Major-General H. D. De Pree, C.B., C.M.G., D.S.O., in the Chair.

Chairman: Gentlemen, I have great pleasure in introducing Captain Ramsay of the Naval War College, who has very kindly come to lecture to us on some of the problems confronting the Navy at the present time.

Captain Ramsay: I would like to say at the outset that I feel it is a great privilege for a naval officer to come and speak at the Royal Artillery Institution, and I feel that the invitation if repeated will always be accepted with great pleasure by any naval officer to whom it may be addressed.

The Chairman, in inviting a naval officer to come and lecture at the Institution, suggested that the lecturer should choose as his subject one about which the Navy would like the Army to be better informed.

The subject I have chosen affords a wide scope because the problems confronting the Admiralty to-day are particularly numerous, ranging from limitation of naval armaments downwards. The problems I propose to talk about are those dealing with the employment of the fleets in war, and the effect of international agreements, progress and invention on the size and composition of fleets.

It might at first sight appear absurd, when the tendency of thought in the higher plane is directed towards the means of settling disputes by agreement, to consider subjects connected with the art of war. But it has never been seriously suggested that all armaments can be abolished and it is of little use to maintain even small armaments unless one knows how to use them, since the mere fact of their maintenance implies that they may have to be used.

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In approaching the problem of the employment of the Fleet in war, it is necessary to have an elementary knowledge of sea warfare and its requirements.

Sea warfare is one of the branches of warfare, of which land warfare is another. The part played by sea warfare is, in the nature of things, less well known than that of land warfare. While the Army's aim is the defeat of the enemy's army, the object of defeating that army is to obtain control of the internal resources and lines of communication of the enemy country. The Navy cannot touch the internal resources as the Army can, but it can control the external lines of communication by sea and so affect the national life. If a country is self-supporting it is to a great extent invulnerable to naval attack though it may lose its overseas trade. Consequently it is the degree to which a nation is dependent on external lines of communication by sea that is the measure of efficiency of sea warfare against it. In the extreme case of an Island nation, sea power could permit of a complete investment. This investment is better known as economic blockade or the exercise of economic pressure.

The exercise of this economic pressure against a hostile nation necessarily involves interference with the trade of neutrals and in this respect it invariably gives rise to difficulties with those neutrals. The risk of neutral intervention in the war, against us, has always to be guarded against.

To get back to principles, it may be said that whilst the Army assaults the enemy country the Navy invests it; investment weakening the power of the enemy to resist assault. The Navy also furnishes the power to assault in other theatres where the enemy is at a disadvantage, by putting the Army on shore and maintaining it there. Sea power, therefore, increases the mobility of the Army.

The obstructions to an investment of the enemy's coast, and the danger to the lines of communication of the Army overseas, are the enemy's naval forces, and it necessarily follows that one of the courses of action of the Navy in war is the disablement of those forces.

By disablement is meant the rendering of them unable to obstruct. The result if successful is control of the sea communications which prevents the enemy from trading, and permits our

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trade to flow unmolested: it also enables armies to be moved and assisted.

The problem which confronts the Navy in this respect is how to bring about the disablement of the enemy's fleet. Whereas the Army can at its selected moment attack the opposing army, the Navy cannot necessarily do so.

If the enemy navy, because of its weakness or other cause, does not desire to engage in battle it can remain at its base, where it is reasonably safe except from land or air forces. Since we always desire an early decision at sea, this predicament is particularly galling.

Investment and assault of the enemy's naval base from the land by an overseas expedition, in the presence of undefeated enemy naval and military forces is and will remain a most formidable undertaking, and one that would in any case involve considerable delay. Attack by aircraft may, under certain circumstances, be possible; but unless in great numbers, and with the aid of surprise, can hardly hope to inflict decisive damage. The chances of air attack are at present, and must remain for some time, controversial and problematical, and so we cannot yet rely on it for success. Therefore we must assume that the enemy fleet would remain a fighting factor and, as such, would constitute a danger to our troop convoys, our trade and to our light forces enforcing the economic blockade.

In the late war we were enabled, by virtue of our geographical position, to base our own fleet safely within reasonable distance of the enemy's base, ready to sally forth and engage him should he emerge.

The fleet in fact took up a covering position which it could permanently maintain and from which it was capable of intercepting and bringing to action, under favourable circumstances, the enemy's fleet within a short time of its leaving its harbours.

The objection to this otherwise favourable situation is the fact that our fleet has to be of considerable superiority in order to allow a margin for relief, as ships have to dock periodically for overhaul. The enemy therefore contains a large number of our ships which might be more actively employed elsewhere.

Thus in the late war the undefeated German Fleet in its

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harbours contained the main strength of the British Fleet in the North Sea, preventing us from using our full strength in other localities such as the Channel, Irish Sea, and Mediterannean where the German submarine campaign assumed its greatest efficiency.

Another case to be considered is where we have not a fleet base to operate from, and that is a much more difficult one. The only powers in the world which now have fleets capable of fighting a fleet action are widely separated. We can no longer count on fighting on our own ground. If we are called upon to fight on a large scale we must go elsewhere to do it.

A glance at the map of the world shows that we have a large number of naval bases; on the route to China via the Mediterranean and via the Cape, in North America and the West Indies; each base having been captured or established in the past to fill some pressing need in war. The scale upon which they have been furnished depends upon the naval forces to be maintained by them, and these in their turn depend upon the national interests to be conserved in the respective areas. Where cruisers only are maintained such as in the East Indies, West Indies and South Africa, the bases are capable only of maintaining cruisers. In the Mediterranean, Malta and Gibraltar are capable of maintaining battleships and now Singapore is being raised to the status of a battleship base. These bases afford mobility to the fleet according to their scale of furnishing.

It has been one of the axioms of naval policy that the fleet should be capable of acting in defence of British interests in any part of the world where those interests are at stake. Concentration in the principal theatre of war provides the means of fighting under favourable circumstances, and no other circumstances can be entertained without unduly risking the safety of the Empire. The fleet having concentrated in the theatre of war investment of the enemy territory ensues, and if the enemy fleet refuse action concentration must be maintained for a considerable period because investment operates slowly. To give the fleet the mobility required to maintain a concentration in the principal theatre of war an advanced fleet base, that is to say a harbour capable of sheltering the fleet, is absolutely essential. If a base does not already exist a suitable base would have to be

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captured and maintained against assault, involving extended combined operations. Harbours which fulfil the requirements would be as well known to the enemy as to ourselves, and the first on the scene would have the advantage.

The fleet itself also requires a considerable degree of mobility in order to operate efficiently when it has reached the theatre of war.

The main fleet, as it would be constituted, would consist of some battle squadrons, a battle cruiser squadron, some aircraft carriers, several cruiser squadrons and destroyer flotillas. In addition there are some submarine flotillas which would accompany the main fleet should it proceed on active service.

We will suppose that the fleet reaches the naval base nearest to the theatre of war. In advance of that point they will, unless they are fortunate enough to be able to take an advanced base in the theatre of war, have to depend upon their own resources.

On the one hand we have the requirements of sea warfare which as I have shown you necessitate a concentration of the main fleet ready at any time to give battle in order to protect the forces investing enemy territory, on the other hand we have a fleet consisting of various types of ships with varying powers of endurance. The endurance of the whole is the endurance of the weakest which is that of the destroyer. The length of time that the main fleet can remain at sea in enemy waters is directly dependent on the endurance of the destroyers.

So the problem which presents itself is as follows:—

We want to be ready to fight a battle under circumstances favourable to ourselves. To do so necessitates that our fleet should be complete in all its units, and that they should have sufficient fuel to fight the action and for the return to their base afterwards. Suppose the enemy refuse to oblige us by coming out to give battle. What are we to do? If we withdraw the whole fleet when the endurance of the destroyers necessitates, the enemy fleet will emerge, drive off our cruisers and regain control of its sea communications, the enemy trade will recommence, investment will cease, thus prolonging the war.

If we send the destroyers back to refuel, the fleet will be without an important arm, and to engage in a fleet action without them with an enemy possessing them, would be to fight under unfavourable conditions.

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In the sailing ship era ships possessed almost unlimited mobility and thus were able to reach and remain for indefinite periods off the enemy coasts. Nelson with the Mediterranean Fleet blockaded the French Mediterranean coast for two years. The advent of the steamship deprived the British Navy of its world-wide mobility. The advent of the torpedo, the submarine and to a less extent the mine has made close blockade impossible, and distant blockade difficult. Thus, while the demands of sea warfare remain unchanged, progress and invention have made it more difficult for the Navy to carry out its functions. It has come about in this manner.

In the sailing ship days the fleet consisted of ships of the line and frigates. The frigates correspond to cruisers of the present day and their principal duty was that of reconnaissance. The ships of the line were the battleships of the period.

For many years the modern fleet consisted of battleships and cruisers. Other craft such as sloops and gunboats were employed only on detached service up rivers and off the coast in shallow waters. Then in the seventies the torpedo was introduced. It was carried in small fast craft called torpedo boats whose function it was to attack ships at night at anchor in their harbours.

This led to the construction of faster and larger craft whose function it was to chase and destroy the torpedo boats, and these vessels became known as torpedo boat destroyers. Their armament was primarily a gun armament but they also carried a couple of torpedoes so that they, also, might be used to attack ships in their harbours.

Progress demanded, as usual, larger torpedo boats and larger destroyers until the former became merged in the latter and all torpedo craft were of the size of torpedo boat destroyers, and though there are no longer torpedo boats to destroy, there are battleships, cruisers and torpedo boat destroyers to destroy. The name destroyer remains universal. In the early days torpedo craft and destroyers were always night birds attacking ships and harbours by night and relying for safety on getting clear before daylight came. Later they began to be employed to co-operate with battleships in day actions, and experience showed that a torpedo attack pressed home under cover of the fire of the battle squadron was a serious potential danger, demanding a separate battery of guns together with its control instruments and personnel to deal with it. Progress

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in torpedo equipment ultimately permitted as many as six torpedoes to be carried and fired almost simultaneously in each destroyer, each torpedo having a maximum range of about 15,000 yards at 23 knots speed, or 10,000 yards at 30 knots speed. The browning effect of a mass torpedo attack by destroyers thus became more and more dangerous, demanding in turn more efficient measures to counter them. The antidote to massed destroyer attack was provided for in two ways. First by gun attack on the enemy's flotillas from our battleships, cruiser squadrons and destroyer flotillas in order to break up the attack before the torpedoes were fired. Secondly by a counter movement on the part of the battle fleet themselves, who took ground away from the attack so as to pass out of range of the enemy torpedoes, increasing thereby the gun range from the enemy battle line. Thus for the first time in history the straight fight with guns between the opposing battle lines was directly influenced by another weapon, the torpedo.

That is what happened at the Battle of Jutland. The Germans employed some of their flotillas to make a massed attack at a time when their line was receiving severe punishment, and it was accompanied by a smoke screen to shut out view of a turn away movement necessary in order to disengage themselves. Our battle fleet turned away according to plan, avoiding in doing so most of the torpedoes. But owing to the increase in range and the smoke screen they lost sight of the enemy and were quite unaware of their turn away. Much valuable time was then lost before the situation became clear and touch regained. From that day to this the efficiency of the torpedo has steadily increased, and though improved methods of countering torpedo attacks exist whereby the gun battle is less interfered with, the threat of massed torpedo attacks is very real. But destroyers are not only necessary for making and countering massed torpedo attacks. They are necessary to the battle fleet, and to a less extent to cruisers, for countering the activities of enemy submarines. That is the principal reason why the endurance of the battle fleet in enemy waters is limited by the endurance of the torpedo craft. Properly screened by destroyers it is not easy for submarines to get in their attack. Without them the big ships run considerable risk.

A word now about cruisers. There are cruisers for duty with the fleet and cruisers which operate on the trade routes. The duty

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of the latter is self evident. The duty of cruisers with the fleet is firstly that of reconnaissance which in itself probably involves fighting. Secondly, when battle is joined their powerful torpedo armament is used at the head of the line to make massed torpedo attacks on the enemy battle fleet, and to support with gunfire our destroyers in their attacks. Also to counter attack enemy cruiser squadrons and flotillas making their attacks. Where one side has cruisers the other side must also have them or accept a disability. Then there is the new arm, aircraft, which at present are carried in carriers, capable of flying off and on all types of aircraft except the largest of the heavy bombers. These aircraft supply the means of reconnaissance and supplement cruisers in this respect. They cannot at present replace them. They also supply torpedo aircraft[1] for attack on the enemy fleet at sea and in its harbours, bombers and fighters.

Battleships, cruisers and destroyers and aircraft thus have their individual and collective roles in battle. The battleship wants a straight fight with the opposing battleship, but is vulnerable to the torpedo. Cruisers and destroyers are provided to make him less vulnerable and by means of their torpedoes assist the heavy guns of the battleships to disable the enemy battleships.

The value of the battleship has often been questioned. Can it be dispensed with? If it is found to be necessary can it be constructed so that it can perform its functions without the aid of destroyers, and for a sufficiently long period to produce the desired effect on the enemy?

First of all what is it for? To answer this question one must survey the situation I have put before you to-day. Apart from the main fleet which, as I have said, is required to cover the activities of the opposing battle fleet, considerable numbers of cruisers, armed merchant cruisers, destroyers and auxiliary craft are constantly employed in the defence of our trade on the high seas and on investing enemy territory, in convoying troops engaged in operations overseas. The forces employed on these duties require cover and the covering force, in other words the main fleet, must be strong enough to meet whatever opposition the enemy can put up. If the enemy possess capital ships our covering

[1] Aircraft carrying a torpedo.

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force must also possess ships capable of fighting them, and so far as the present state of knowledge goes, the only effective weapons against capital ships are ships mounting artillery which can deliver at least as great a volume of fire as theirs. In other words we also require capital ships. Size of ships is, then, mainly a relative matter.

The capital ship, using the term in so far as it relates to a ship as powerful as any possessed by another nation, is a necessity to us as a maritime power. The capital ship is the foundation of naval strength. In its present form it is a surface ship and known as a battleship, but what the future holds for us, in this respect, one cannot tell. That we have reached the final stage in design of capital ships is not to be thought of. The aim will be to produce a ship which will be able to afford cover for prolonged periods in waters adjacent to the enemy main base, for cover in order to be effective must be constant. When this is made possible the problem of the employment of the fleet in war will be greatly simplified and its functions more efficiently performed.

So much then for the employment of the fleet. The problem which is at present agitating the principal maritime powers is the size and composition of their fleets. What is the size of our fighting forces based on? The Army, as you well know, is based on definite peace commitments which can be calculated with exactitude. The size of the Air Force is less easy to remark upon, but the size of the Navy is now largely a matter of international agreement. During the long period prior to the rise of the German Navy, it was a part of national policy to maintain a fleet equal in strength to the two next greatest maritime powers omitting the United States. The advent and rapid growth of the German Navy forced us to increase the size of our fleet but it was impossible to maintain our previous policy of a two power standard, so in 1912 the Government were forced to modify it and accept in lieu a 60% superiority in capital ships over the next most powerful fleet, i.e. the German.

The close of the War found us with an enormous fleet of ships of all classes. Over forty capital ships alone. With the disappearance of the German battle fleet, the need for this huge fleet no longer existed. The only other nations with powerful battle fleets were the United States and Japan. The former was building some thirteen of the latest capital ships, Japan six and ourselves four.

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As it was obvious that the fleets built and building were out of proportion to the needs of respective nations, taking into account the elimination of the disturbing element for war, the five principal maritime powers agreed to meet in conference at Washington in 1921/22. In the words of the Treaty: "Desiring to contribute to the maintenance of the general peace and to reduce the burdens of competition in armament": they agreed to limit their respective naval armaments.

The results were far reaching and can be briefly summarised as follows:—

The total tonnage of capital ships was fixed for each nation and the ratio worked out between the United States, ourselves and Japan allowed a maximum number of ships of 15.15.9 respectively.

Each capital ship is now limited to 35,000 tons and its guns to 16 inch. Any ship over 10,000 tons or carrying guns greater than 8 inch is called a capital ship.

Aircraft carrier total tonnage was limited to 135,000 tons. Ships were not to exceed 27,000 tons and guns not to be greater than 8 inch.

An effort was made to abolish submarines and limit the numbers of cruisers but no agreement could be reached on these points.

The number of capital ships and carriers in the fleet is therefore definitely limited, and based solely on an arbitrary agreement.

Since the date of the Washington Treaty constant efforts have been made to further limit the size of fleets, particularly in regard to cruisers.

The Geneva Naval Conference was held in 1927, and the preparatory commission on disarmament was also held earlier in the same year. This year has witnessed the debacle of the so-called Anglo-French compromise! Time does not permit of following the workings of the various conferences but everyone knows that a satisfactory agreement has yet to be reached.

Discussion has, in the main, centred on the cruiser question. The size of cruisers was limited at Washington to ships of 10,000 tons carrying guns not exceeding 8 inches calibre. Consequently nations started building ships of the maximum proportions. These ships are very expensive, costing in the neighbourhood of £2,000,000 to build. The requirements of trade protection of the British Empire demand a larger number of cruisers, considerably more

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than any other nation. If all these cruisers were of the 10,000 ton type it would be impossible to build and maintain them without increasing the naval estimates, and as the whole aim is to decrease expenditure on armaments this result could not be contemplated.

Great Britain desired therefore to limit the number of 10,000 ton cruisers in the same proportion as that laid down for capital ships, leaving each nation free to build what less expensive ships it required for its special circumstances.

It is in respect of this aim that we come into conflict with the policy of the United States. They contend that there should be parity between us in regard to cruiser tonnage and that each nation should make what use it pleases of the tonnage allowed. For themselves they contend that only 10,000 ton ship mounting 8 inch guns fill their requirements owing to lack of oversea bases which limits the mobility of the small cruiser, and for other reasons. They also maintain that we possess a large number of potential cruisers in war in the shape of suitable merchant ships which can be armed with 6 inch guns and therefore it is necessary for their cruisers to carry guns of a larger calibre.

Our respective requirements differ. We require numbers; they want size, and so it seems that an agreement between us is going to be a matter of extreme difficulty. Indeed it seems that unless the problem can be approached from a totally different standpoint, agreement is impossible.

In this respect I cannot do better than quote from an article by the Washington correspondent of *The Times*, published on the 26th November, 1928.

Speaking of Senator Borah he writes :—

> "He does not believe that naval limitation will ever be possible unless the international rules affecting the position of the neutral in war are refashioned . . . . The policy of the United States in this all important matter . . . . differs from the British in this : that it is predicated upon the assumption that in any future war the United States will be neutral, whereas Great Britain must allow rather for the contingency that she will be a belligerent. Preparation for neutrality, however, is to be at least as considerable as for belligerency, as can be seen from the approaching Cruiser Bill . . . .

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> Beneath all the talk of 'parity' lies, so far as the American mind is concerned, the conviction that Great Britain in any future war which should include her would seek to control the seas to the detriment of American and other commerce, and that equality of strength is needed *to defeat that object.* More and more . . . . it is admitted that without agreement upon a 'liberalised' code of maritime law there can hardly be found any mutually acceptable basis for Anglo-American naval limitation, and that until such a basis is found, rivalry at sea can hardly be avoided."

Here we find ourselves in contact with the demand for the "Freedom of the Seas," one of the ideals of President Wilson which he tried unsuccessfully to insert into the Treaty of Versailles. The freedom of the seas, stripped of all side issues, means that sea communications are free in war to everybody. That the enemy can continue to trade and draw his munitions of war from overseas without interference. The function of navies in these circumstances would be confined to the safeguarding of troops on the high seas, for protection against invasion or raids, etc. Wars would be a matter for the Army and the Air Force, who would be permitted by the freedom of the seas to draw all the supplies they required to intensify and prolong the horrors of war on land. There would thus be one law for external communications by sea and a totally opposite law for external communications by land, and it is certain that an international agreement so ill according with the realities of the modern world would be abrogated in the course of any future war, if that supreme calamity should come about.

(A discussion followed.)

CHAIRMAN: Then if there is nothing more, it only remains for me to thank the lecturer for his exceedingly clear analysis of the broad principles and the nature of naval warfare and also of the actual problems which confront the Navy now. I think the way he showed us the contrast between the problems before the War and the present problems was extraordinarily interesting, and I think we all owe him a great debt for coming here to explain them to us. (Applause.)

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8th AUGUST, 1918.

A Lecture delivered at the Royal Artillery Institution
Tuesday, 22nd January, 1929.

BY LIEUT.-GENERAL SIR ARCHIBALD MONTGOMERY-MASSINGBERD, K.C.B., K.C.M.G., COLONEL COMMANDANT, R.A.

Field-Marshal Sir George Milne, G.C.B., G.C.M.G., D.S.O., D.C.L., LL.D., Colonel Commandant, R.A., in the Chair.

CHAIRMAN: Gentlemen, I do not think I need introduce you to Sir Archibald Montgomery-Massingberd, and all I have to do is to ask him to deliver his Lecture.

LIEUT.-GENERAL SIR ARCHIBALD MONTGOMERY-MASSINGBERD: When considering the Battle of Amiens it is important not to take it out of its setting. We have to remember, first of all, that it took place at the end of four years of very hard fighting, and whereas in 1914 the Germans had 72 divisions and 11 cavalry divisions on the Western Front, and the Allies—British, Belgians and French—78 divisions and 8 cavalry divisions, those numbers had grown by August 1918 to about 200 divisions on each side. Moreover those divisions by that time were very largely citizen armies; they were not the old professional armies of 1914. They had a sprinkling of the old element of course, especially in the senior ranks. Also the material aids on both sides had increased out of all knowledge. We had large numbers of tanks, the Germans a few; on both sides machine guns, heavy guns, etc., had increased enormously.

The battle of Amiens was really the beginning of the final round of this long struggle. The armies on both sides, or a considerable part of them, had taken part in the bitter fighting of 1914 and 1915; they had been decimated at Verdun and the Somme in 1916 and at Passchendaele, Arras and Champagne in 1917; and, finally, a large part of them had been through the big

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German advance of March and April, 1918, with the result that both sides were approaching exhaustion and it was mainly a question of which side could stay the longest.

August 8th was the first occasion on the Western Front, except at Cambrai, where a big strategical surprise had been obtained. It differed from Cambrai in that at Cambrai there were no reserves on the British side available to exploit the results of the surprise—just as in 1915, when the Germans made their first gas attack, which turned out to be more or less a surprise, they had nothing at hand with which to exploit their success. On August 8th it was different. G.H.Q. had arranged for sufficient reserves behind the Fourth Army to ensure that the surprise should be fully exploited.

Again, it was probably the most outstanding example during the whole war on any front of an army recovering its morale in a comparatively short space of time, and those of you who were in France in 1918 will, I think, bear me out in this when you remember the state of exhaustion that the British army had reached by the end of April, 1918, and how very near it had come to defeat during the anxious weeks at the end of March and the beginning of April, 1918.

The attack of August 8th differed from the German attack on 21st March, 1918, in several particulars, but the relative numbers on the two sides in these two attacks is of especial interest. When the Germans attacked on the 21st of March, 40 German divisions attacked the Fifth Army which consisted of 14 divisions and 3 cavalry divisions, and the Fifth Army, during the next week or so, was only reinforced by one division, the 8th. So it was 40 German divisions attacking 15 British. On the British side, to start with, only 11 divisions attacked, 4 Canadian, 4 Australian, and 3 of the III Corps, backed up by three cavalry divisions; a total of 11 infantry divisions and 3 cavalry divisions. They attacked the *Second German Army*, which consisted of 15 divisions, two of which were opposite the French XXXI Corps. That German army was reinforced during the next three days by another 12 divisions, while the Fourth Army was reinforced by 3 divisions, so that the Fourth Army of 14 infantry and 3 cavalry divisions during those four days' fighting engaged altogether 25 German divisions and destroyed a good many of them.

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The *Second German Army* was commanded by von der Marwitz. Just south of it was von Hutier's *Eighteenth Army*, which soon became implicated because the break in the *Second Army* front and the advance of our Fourth Army threatened the right flank of the *Eighteenth* and also its rear. It is satisfactory to remember that it was von der Marwitz's and von Hutier's armies which had taken such a very large share in the great German March attack.

I would now draw your attention to the first sketch map, that is to say, the German situation on August 6th, 1918. It is taken from the official records at G.H.Q. at the time. You will see from it that by far the biggest group was the Crown Prince's. That, of course, was the result of the attacks the Germans had made towards Chateau Thierry on May 27th, towards Compiegne on June 9th, and the final attack which they made on each side of Rheims on July 15th. Then came Mangin's counter-attack from Villers Cotteret which drove or helped to drive the Germans back to the Vesle. Rupprecht's was the next biggest; the others did not really count. Rupprecht had 71 divisions and that group still contained up to the 8th August something like 30 divisions in reserve, with which it was intended to make another attempt to capture the Channel Ports. The first effect of the attack of August 8th was to cause that attempt to be given up. Within about a month of the 8th August nearly all those reserve divisions had been taken away from Prince Rupprecht to fill up the gaps in the German line. You will see on the map that the total of the German divisions, if you include the cavalry and one Austrian division, was 206, while on our side there were 203, but you must remember that in these 203 are included 30 American divisions of which 20 were untrained and in the back areas, so that the advantage in number of divisions was still on the German side. In March, 1918, the Germans had also had a considerable superiority, 193 divisions against 176. We must also remember that such American divisions as were trained were very much stronger than any of the other divisions in the field. The strength of the American divisions was not very far from 30,000.

The two main factors of our success on 8th August were undoubtedly surprise and superiority of morale. As regards sur-

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prise, August 8th is an example of what degree of secrecy can be obtained if proper steps are taken and every detail is worked out, and of the thorough staff work which it required to collect such a large number of men, horses, guns and material on a front of about 22,000 yards without the Germans discovering or having the slightest idea that such a force had been collected there. It was done solely by paying due attention to secrecy and by really efficient administrative staff work. It was the administrative arrangements on August 8th that made that victory possible probably more than anything else.

One other very important lesson of the battle was the influence of the individual commander, and that applies to the German as well as to the British side as you will see when we come to August 9th. There has been a certain amount written as to who originated the idea of this attack but, to my mind, the truth is really perfectly plain, that is to say more or less the same idea came to several people at approximately the same time. On the 12th July Marshal Foch wrote to Lord Haig and told him he wanted to free the Bruay Mines. On the 16th July, directly after the German attack on both sides of Rheims had failed, Lord Rawlinson went up to G.H.Q. to see Lord Haig personally and to put before him verbally a proposal for an attack on the Amiens front, because he felt that, from what we had found out, the German morale in front of the Fourth Army was very poor and the defences weak, and that all the factors on that front were very favourable to an attack. Lord Haig's inclinations were undoubtedly in the same direction. He had had his eye on the Amiens front too, and the result of that conversation on the 16th July—all these dates fit in very well—was that he wrote to Foch on the 17th July to say that he did not like the Bruay plan at all, and that he wished to attack on the Amiens front, secure the junction between the British and French for good and all, and clear the railways. On the 16th July he had told Lord Rawlinson to carry on with his preparations, and on the 17th Lord Rawlinson sent up to G.H.Q. a detailed plan of attack. That, excepting in one important particular, was the attack which was actually carried out, and the important particular is an interesting one, because with all due deference to Marshal Foch I still feel convinced that the original plan would have been even more effective than the plan that was actually carried out.

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Lord Rawlinson's plan was that the attack from Amiens should take place between Moreuil in the south and Morlancourt in the north, and should be entirely British; and his reasons for this are clear. One was that four years of experience had shown that an attack by two allied armies was not nearly so easy to keep secret as one carried out by a single army, whether British or French. That was his chief reason. The second was that strategically he considered that it would be much better for the French to collect all the available reserves they could further east and strike in from the south, from the direction of Montdidier, as soon as the British attack had shaken the German defence. This they actually did on the 10th August, but by that time the first shock of surprise was over and German reserves had arrived. Lord Rawlinson's plan would have compelled the Germans to face both ways on the 8th and would have been more effective than the purely frontal attack that actually took place.

After a great deal of argument at Marshal Foch's Headquarters on the 26th July it was decided that the Marshal's plan should be carried out, that is to say, that in the first instance the British and French should attack together from the same direction. The French attack was to be made south of the Roye Road, between it and Moreuil, by the 31st Corps. General Debeney, who commanded the First French Army, was to be under Lord Haig's orders for the battle. The first conference with his corps commanders was held by Lord Rawlinson on the 21st July, but no divisional commanders were told anything before the 30th July. The result was that the plans for the attack did not reach the brigades and battalions till about 36 to 48 hours before the attack took place and therefore any prisoners that were taken—and there were some taken—could give nothing away. The original date fixed was the 10th August. That was advanced to the 8th August by Marshal Foch about 31st July, and the scope of the attack was also somewhat enlarged by the Marshal on the 5th August. The Fourth Army instead of contenting itself with clearing the Amiens defences and the railways was, if successful, to advance on Nesle and Ham.

The general idea was thus that the XXXI French Corps, the Canadians, who were brought down for that purpose, the Australians and the III Corps were to attack from Moreuil to the Ancre in

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a south-easterly direction and, if successful, were to push right on to Nesle and Ham, which would enable them to clear the fronts of the Third and Tenth French Armies.

Now there were several favourable factors on the Fourth Army front. The German morale was very low, as we had discovered chiefly through the enterprise and dash of the Australian attacks during the months of May and June, finishing up with a surprise attack made at Hamel on the 4th July, in which six Australian battalions advanced on a 6000 yards front, assisted by 60 tanks, and took 1500 prisoners at a cost of 1000 casualties. That gave us a good idea of what could be done and also of the state of the German defences, which were extremely poor. The ground was very suitable for cavalry and tanks. We knew that there were only 5 German divisions in reserve behind the *Second German Army*. The artillery observation, especially from the Corbie Ridge, was perfect. The morale of our men, and especially of the Australians and Canadians, who had taken no part in the March retreat, was as good as it could be, and the Canadians had the great advantage of going into battle with brigades of four battalions and every battalion with a thousand men. You will remember, many of you, what a tremendous advantage that was. The British divisions were at a decided disadvantage; they had difficult ground to advance over; they were all divisions which had been fighting in the March retreat; they had lost a great many of their best officers and had been filled up with 19-year-old boys, and although they had come on very well indeed and were improving every day, they were not, of course, of the same high standard at that time as the Australians or the thousand-strong Canadian battalions. But a remarkable fact about the morale in the British divisions is that out of all the divisions, British and Dominion, that took part in the battle of Amiens there were two (18th and 32nd) that went through the whole fighting up to and inclusive of the 4th November, which was the last battle that the Fourth Army fought, improving every day, and those divisions at the end of all that fighting and on the top of what they had undergone before in March and April, were by the 4th November probably the equal of any Dominion troops.

The plan of attack was based chiefly on three previous battles;

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Tanks surrounded with corpses near Albert, 8th August, 1918.

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first on the lessons of the Cambrai surprise attack of November 1917, secondly on what we had learnt from the German attack of March 21st, but from which it differed in one important particular. The Germans in March had no tanks so that a bombardment was necessary, and they put in a very strong bombardment from 5 till 10 in the morning. On August 8th there was no previous bombardment, partly because we wanted to ensure complete surprise at zero, partly because we had tanks, and lastly because the German defences were very poor. We copied one thing in particular from the German attack; at zero the whole army moved forward, that is to say, not only the attacking divisions with their tanks but the cavalry, the reserves, and a large part of the artillery. There was no waiting to see whether the leading lines were successful. The last battle from which lessons were drawn was the attack at Hamel on the 4th July, 1918, which, as I told you, was fought on a very wide front, six battalions on 6000 yards, compared with the divisional fronts of from 1200 to 2000 yards which we had been accustomed to in 1916 and 1917. At Hamel moreover the tanks had been very well schooled with the infantry; they had practised with them frequently and they knew each other, and the co-operation between the two had reached a very high level.

Many steps were taken to "mystify and mislead" the Germans. Two Canadian battalions were put in at different parts of the front near Kemmel on the Ypres front and prepared for an attack at Kemmel hill, which had been lost by the French in April 1918. Casualty clearing stations and aerodromes were established in that area and wireless was erected there not only of the divisions in the line but also of all reserve divisions. These preparations drew so much attention to the north that King Albert protested officially against an attack being prepared on his front without his being consulted. This was exacty what was wanted, because that rumour immediately spread everywhere. Further south on the front of the First and Third Armies the wireless of the various reserve divisions were erected. A tank battalion near Arras rehearsed attacks by day. Movements of transport by day were allowed in the First and Third Army areas. Several rumours were spread about as regards the destination of the Canadians; one that they were going to relieve the Australians and another that

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they were going to take the place of the XXII Corps with a view to their covering the junction of the English and French armies or of going still further south if required. These rumours were allowed and encouraged to spread, so that the gossips on the L. of C., at the base, and at home, who were always looking out for stories wherewith to display their knowledge of what was going on at the front, had ample material at hand, and spies and agents would find it very difficult to discover what was really going to happen.

On the Fourth Army front the precautions for secrecy were very carefully worked out. One of the most effective was a large coloured poster which was put up in every village in the front and back areas early in July warning all ranks to keep their mouths shut and not to discuss future operations, and pointing out to them what they should do if they were unlucky enough to be taken prisoner. A small leaflet was also issued which was to be stuck in every man's pay book, giving the same sort of directions. The results were remarkable. Several cases came to light afterwards of men being taken prisoner from whom the Germans were able to find out absolutely nothing. This was ascertained from German intelligence diaries captured during the advance. The men played up extremely well and entered whole-heartedly into the spirit of the orders.

No movement of transport eastward was allowed except at night, and aeroplanes were up all day watching to see if there was any extraordinary movement visible from the air. The work in the back lines was continued up to the evening of August 7th. The Canadians were kept well back; they did not actually take over the front line till two hours before zero and the Germans had no idea at all that the Canadians were in the neighbourhood. Officers going up to reconnoitre were warned to go up in very small parties and to avoid a not unusual custom of waving maps about when they got to the front line. No general registration of new batteries was allowed. 128 new batteries came into position and they were only allowed to register a few rounds on a certain definite plan which was laid down by the C.R.A. of the army. The corps commanders, as I have told you, were not allowed to discuss the plan with their divisional commanders till the 30th July.

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An interesting point from a gunner's point of view to remember about this battle is that two-thirds of the heavy artillery, that is to say everything larger than a 4·5″ howitzer, was employed on counter-battery work. We had located practically every German battery, and this large weight of material, which amounted to something over 400 guns and howitzers, came down at zero on those batteries with the result that there was practically no reply from the German artillery. The other principal points to notice are that the cavalry patrols were well forward almost with the leading infantry, sending back information and preparing the way for the cavalry division to go on the moment the opportunity arrived.

There was intense air co-operation. Machines were swooping down and machine-gunning the guns and transport of the retreating enemy. There was also an intense battle for air supremacy fought during the morning, in which I understand at least 70 machines a side took part, with the result that for the time being we had complete air supremacy, but we lost a large number of machines.

The tanks were to follow close behind the barrage, in fact, right under the barrage with the leading infantry.

The concentration actually began on the night 29th—30th July. There were an additional thousand guns to be brought up and placed in position and these began arriving on the 29th—30th July, and were in position by August 5th—6th. Not only had their positions to be prepared but large dumps had to be formed. These were on a very liberal scale. The field guns were allowed 600 rounds, the 6″ and 8″ howitzers were allowed 400, and even the 12″ howitzers were allowed 200. That, of course, meant a great deal of work carrying up the ammunition. All the echelons in addition were full. The Canadians began arriving in the back areas on the night 30th-31st; they not only had to relieve the Australians but they had to reconnoitre the ground and prepare their plans of attack, so it will be easily realised they had a very stiff task to carry out. They were all in position behind the line by the night August 3rd—4th but, as I have told you, they did not actually take over the front line until two hours before zero, when they replaced the 13th Australian brigade, which had held the whole of the Canadian front. The tanks began to arrive on the night

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of July 31st—August 1st, and completed on the night of August 4th—5th. They came up mostly by rail and part of them on their own tracks. The cavalry did three night marches from near Auxi-le-Chateau and arrived just west of Amiens on the evening of 6th—7th. They marched through Amiens on the night of the 7th—8th and were in position on the open plain east of Longueau (just east of Amiens) by zero hour.

I do not want to go into detail or to give you many figures, but to a gunner audience a few figures as regards numbers of batteries may be interesting. There were 3 horse artillery brigades with the cavalry. 52 field artillery brigades and 26 garrison artillery brigades (60 pr., 6″, 8″, 9·2″) took part, and ten 6″ gun batteries and three 12″ howitzer batteries. The actual number of rounds fired on the 8th August was of course nothing compared to what had been fired in some of the other big battles. Roughly it was about a quarter of a million rounds by the 18 prs. and a quarter of a million by other calibres. As regards the 18 pr. rounds, 150,000 of it was shrapnel, 114,000 H.E. and 12,000 smoke. The Australians favoured shrapnel and the Canadians and the III Corps favoured more H.E., and they all used about 10 per cent. of smoke. The average number of rounds fired by the 18 prs. throughout the army was 300 per gun on the 8th August, the 4·5″ howitzers 200, and 9·2″ howitzers 100 rounds. On the other three days half a million rounds altogether were fired by all calibres. That is a total of about a million rounds of all calibres fired in the four days.

There were 456 tanks available of which 96 were whippets, all of which went with the cavalry, the Canadians and the Australians had the 4th and 5th Tank Brigades of four battalions each. The III Corps one tank battalion, and one battalion was in reserve. Two battalions were Mark V starred, the remainder Mark V. The Mark V starred were supposed to carry machine gun and Lewis gun detachments, but that experiment was far from successful.

There was a large force of the R.A.F. available. The 5th brigade consisted of two wings. The 15th wing consisted of six corps squadrons. The Cavalry, Tank Corps, III Corps, Australians and Canadians each had one. The other dropped small arm ammunition by parachutes when required. The 22nd Wing had 8 squadrons of scouts, mostly used for work against ground troops,

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and three bombing squadrons. Those were all Fourth Army units. In addition we were given another 8 bombing squadrons and some scout squadrons from G.H.Q., so that the R.A.F. had a very strong force available.

The administrative arrangements were on a very large scale, of which the following will give you some idea.

Advanced gun park. Longueau, also a complete train was ready at Calais at six hours' notice, with :—

2 60 prs. and 6″ hows.
12 18 prs.
50 machine guns.
200 Lewis guns.

Workshops. 2 light and 1 medium for each corps.

Petrol, etc. Each tank brigade had 80,000 gallons of petrol, 20,000 lbs. grease, 20,000 gallons of oil, in reserve.

Supplies. All cavalry units started with three days' iron rations and 20 lbs. per horse.

Water. 20 water lorries per corps.

Medical. 11 casualty clearing stations.
$3\frac{1}{2}$ motor ambulance convoys.
6 ambulance trains (with four more in reserve).

Prisoners. Main and advanced cages for each corps.
3 main cages for the army.
1 for further interrogation.
1 for evacuations.
1 for overflow.
This proved to be insufficient for 16,000 prisoners captured on August 8th.

It took 230 special trains to bring up the reinforcements and 60 more to bring up the extra ammunition. These 290 special trains had to be run into Amiens and the neighbourhood in the previous week.

The German dispositions are shown on the second sketch map. The *Second Army* consisted of three corps. On the north there was the *XIV Corps*, then came the *XI* and then the *LI*. In the *XIV Corps* there were the *233rd Division*, the *54th Reserve Division*, then the *27th*. Astride the Somme was the *43rd Division*, and this division, fortunately for us, was being relieved during

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the night of the 7th—8th by the *108th Division*, so that they were both caught in the rout instead of only the *43rd*. In the *XI Corps* were the *13th* and *41st* and then the *109th*, which was also being relieved by the *117th*. South of the Luce in the *LI Corps* were the *225th*, the *14th* and the *192nd*. These last two were facing the French but the Canadians soon encountered some of their reserve units. Most of those German divisions were weak in numbers, which in some cases were down as low as four or five thousand actual fighting men. There were about 680 German guns on the *Second Army* front of which 450 were captured altogether, and about 300 of them on the 8th August.

Two disturbing events took place on the 3rd and 6th August. On the 3rd August a small Australian post of one sergeant and four men was captured at Hourges, which is on the Roye road east of the Luce. On the 6th August the 18th Division was attacked north of the Somme. It was a big attack and was meant for the Australians, who had never ceased worrying, and the Germans sent down a special attacking division, the *27th Wurtemberger*, for the purpose. Thirty-two mortars and 96 batteries supported this attack. Unfortunately for the 18th Division it hit them instead of the Australians, and the Germans penetrated their line to a depth of 800 yards. They took over 200 prisoners and reached some of the artillery dumps. It was thought that they must discover something, but such was not the case. If the prisoners knew anything they gave nothing away, and the Germans found out nothing at all. At the time it was very disturbing.

I am not going to attempt to describe the attack in detail, if you wish you can read it in the "Story of the Fourth Army," but I want to call your attention to a few points about it. One of the main difficulties we had was hiding the horses when they were watering, during the concentration before the 8th August. I cannot tell you the exact number of horses there were in the Fourth Army, but if you consider the number of field artillery batteries and the transport, you will realise how large the numbers must have been and how difficult it was to hide them. Nothing gives a concentration away more than large numbers of horses going down to water. Fortunately for us the cavalry only arrived during the last night and for three or four days before the 8th the weather was not good

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Battle of Amiens. R.H.A. gunners examining a captured 77 m/m field gun and machine gun, Malard Wood, 9th August, 1918.

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for air observation and the Germans never discovered anything, but it is an important point to remember and a very difficult one to get over.

The green line, that is the first objective, was about 3500 to 4000 yards from our front line, and was selected mainly for two reasons. First it was the limit of the 18 pr. barrage; it could reach no further. Secondly it included the bulk of the German guns, mostly in the valley which runs from Cerisy to Warfusee on the Brie road, and another group near Wiencourt and Marcelcave. The red line or second objective was another 2000 to 5000 yards further off, and was selected as a good line of defence to occupy in case of a counter-attack, which of course did not materialise. The blue line, or third and final objective, followed the line of the outer Amiens defences, which, though out of repair, gave a very definite objective, was wired towards the east and would make a good line of defence if required.

There were several different methods of leap-frogging employed. The III Corps and 1st and 2nd Canadian Divisions leap-frogged by brigades; the Australians and the 3rd and 4th Canadians leap-frogged by divisions. It depended largely on the ground and other reasons, and one method was as good as the other.

Another point to notice is the way that the formations in the III Corps were broken up. The German attack on the 6th August was partly responsible for this, as the 18th Division had the 54th Brigade disorganised for the moment, but if you compare the III Corps dispositions with those of the Australians and Canadians you will see how very much the former's formations were broken up. Battalions were taken away from brigades and given to other brigades. I cannot help feeling that so much breaking up of formations was unnecessary and unsound.

Another point to note is the liaison force which was established to keep touch between the French and the Canadian advance, and which worked along the boundary line. It consisted of a platoon of Canadians and 30 Frenchmen under a French officer working under orders of the right battalion of the Canadian attack. This liaison force was employed with very good results. Another one was employed on the inner flank of the Canadians and Australians, consisting of two companies of Canadians and two of Australians,

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advancing along the railway, and it helped very materially to keep touch between those corps.

The Canadian and Australian fronts, as you will see, were about 7000 yards each. The III Corps front was about 5000 and the most difficult ground. The next most difficult ground was the 3rd Canadian front because they had to cross the Luce before they could develop their attack. The 1st and 2nd Canadians and the 2nd and 3rd Australians had easier ground to attack over. It is open country with villages dotted about on the plain and few obstacles. There are no isolated farms; all the farms are in the villages and cluster round the church. There are a certain number of woods and coppices. These and the villages were the only obstacle to the Canadian and Australian advance.

Zero was at 4.20 and the barrage preceded the advance as far as the green line. There were certain delays which made some units behind time, but on the Australian front and part of the Canadian the green line was reached up to time, that is 6.20. There was a two hours halt on the green line to enable leap-frogging units to come up before a further advance took place. The red line was reached by all units by 11.30 or 12; the earliest were the 5th Australians who got there at 9. Between the red line and the final blue line there were various delays. There was considerable fighting at Beaucourt which delayed matters in the south, and there was a good deal of fighting in the valley of the Luce but the net result was that the Australians reached their furthest objective by between 10.30 and 12. The Canadians were rather later; they did not reach theirs till the afternoon. Their first units reached the blue line about 1 and their last unit not till after 6. They never actually reached Le Quesnel itself but, speaking generally, south of the Somme there was not much difficulty in arriving at the distant objective and the losses were comparatively small. The cavalry went through early, the 1st Cavalry Brigade on the Australian front and the Canadian Cavalry Brigade on the Canadian front. The first to reach the blue line was the 1st Cavalry Brigade near Vauvillers at 10.15. Beyond the blue line cavalry soon met more serious opposition and were unable to make much progress. The 5th Dragoon Guards however captured a train full of Germans near Framerville. North of

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the Somme the story was rather different. When the III Corps attacked they reached the green line all right, but when they got involved in the difficult country near Tailles Wood and Chipilly they were counter-attacked by the Germans and driven back practically to the green line. The result of this was that the Germans were able to employ artillery on the north of the Somme against the left of the Australian advance and inflict losses on the infantry and the tanks accompanying the 4th Australians. The details of the fighting you can read for yourselves; I cannot attempt to give them to you here in the short time available and there is not much to learn from them.

It is not exaggeration to say that at zero on the 8th August, the battle was already won. The surprise was so complete, the confidence of the troops was so great and the forces we had there so superior to the Germans in morale that once the attack was started the result of the battle was never in doubt. It was only a question of how far we could go and that was largely dependent on the endurance of the troops. You must remember that these men had been up all the night before and had actually covered up to 8-10 miles in marching order, and therefore even if they had been wanted to go further it is doubtful whether most of them could have done very much more that day. As I have told you, the cavalry did try to go further but encountered strong opposition almost at once, and in addition reached the old battle area of 1915 and 1916, which is covered with old French and German trenches and wire—a country almost impossible for cavalry and difficult even for tanks.

Let us now turn to the German side on the 8th of August. Prince Rupprecht, in his official report after the battle, stated definitely that there were no signs of any kind pointing to a big attack on the front of the *Second Army*. This I think conclusively proves that the Germans had no warning at all of what was coming. The first news of disaster reached Prince Rupprecht, whose headquarters were near Mons, between 7 and 7.30 in the morning. At that time the *Second Army* had only three (the *21st*, *107th* and *243rd*) of its five divisions left in hand, as the other two (the *108th* and *117th*) were, as I have already told you, relieving divisions in the front line and were already involved in the disaster. The

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Eighteenth Army, whose right flank only was at present engaged, had about four divisions in reserve (the *119th, 1st Reserve, 82nd Reserve* and *204th*). The *Seventeenth Army* had three or four (one-third of the *26th, 5th Bavarian, 221st* and *185th*). The *Seventeenth Army* of course was not engaged at all, and could therefore spare some of its divisions to come down south. The first troops that were moved were the *243rd* in the north, which was employed against the III Corps together with some of the local units of the *XIV German Corps*. The *107th* was moved down from the neighbourhood of Bapaume and Peronne and came into the battle during the evening about Proyart and Framerville. In the south on the Roye Road the *1st Reserve* and *82nd Reserve Divisions* were moved up and reached Le Quesnel in the afternoon, and were undoubtedly the reason why Le Quesnel was so difficult to capture, and was in fact not taken until next morning. I have not been able to ascertain definitely whether these divisions were moved up by the corps concerned or by the army. Ludendorff and Prince Rupprecht were communicating by telephone between Spa and Mons; and Rupprecht was in touch by telephone with the two army commanders of the *Second* and *Eighteenth Armies* at Cambrai and St. Quentin. It is very difficult to find out by whose orders the various divisions were moved forward into the battle, nor is it really of very much importance.

Rupprecht, as soon as he heard the bad news, warned other divisions to stand ready to move by bus, while their artillery went by road. These divisions were the *26th, 5th Bavarian, 38th* and *119th*. The move also of the *79th Division* from the *Ninth* to the *Eighteenth Army* was expedited. At 9.30 Ludendorff had begun to realise the seriousness of the situation and took all the steps he could to repair the disaster. He ordered the *Alpine Corps* down from the *Fourth Army* in Belgium to arrive at Nesle by 6 a.m. on the 9th—this was one of the crack corps of the German Army. He took all the available reserve heavy artillery from the *Fourth* and *Sixth Armies* and sent it down to reinforce the *Second Army*. He ordered all the reserve field and heavy artillery of the *Second, Seventeenth* and *Eighteenth Armies* to come in behind the *Second Army* to replace the artillery which had been lost. The *Seventeenth* and *Eighteenth Armies* were ordered to send all the aircraft they could spare to help the *Second Army*.

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During the day one-third of the *26th Division*, north of the Somme, moved to Cappy, near Bray. The *119th* arrived in busses at Rosieres and Vrely about 12 o'clock, and their de-bussing at these places was actually reported by our aircraft, though we did not know of course at the time what the movement meant. It was the *119th Division* who were largely responsible for stopping any further advance by the cavalry. The *38th, 21st* and *5th Bavarian Divisions* also crossed the Somme near Peronne during the day and reached Villers Carbonnel, Flaucourt and Estrees respectively that evening.

The result therefore of these moves was briefly as follows. The *243rd Division* had helped to check the III Corps and retained possession of the Chipilly Spur. The *107th* enabled Vauvillers and Framerville to be held until attacked in force by the Australians next day. The *119th* held up the cavalry advance in the centre. The *1st Reserve* and *82nd Reserve* had strengthened the left flank at Le Quesnel. Behind these and available for the next day's fighting were part of the *26th* at Cappy; the *5th Bavarian, 38th* and *21st* in the centre on the Brie Road; and further south the *79th* and *221st Division* were brought up to the neighbourhood of Bouchoir to support the *1st Reserve* and *82nd Reserve*.

The situation on the front at half past two was very accurately reported to Rupprecht. Briefly it was that Chipilly was still held, which was correct. That our tanks had got through to Foucaucourt on the Brie Road—these as a matter of fact were not tanks but armoured cars. The armoured cars I might here mention passed through the infantry at an early period of the advance. They crossed the blue line at 9.30, thence turning north and south. Some went to Proyart, some down to Framerville, where the German *XI Corps* headquarters were situated. They missed the corps commander by about half an hour but were able to inflict casualties on the staff, who were apparently still at breakfast. The *119th Division* was reported to be holding up the enemy in front of Rosieres and Vrely; and Beaucourt had been lost.

Between 2.30 and 5 Prince Rupprecht appreciated the situation as follows. I cannot tell you whether this appreciation is his own or that of his Chief Staff Officer, Lieut.-General von Kuhl, but it is an interesting one. He considered that his right was safe.

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That his left had been much relieved by the counter-attack up the Roye Road of the *1st* and *82nd Reserve Divisions*. That the centre was very shaken; and that the main hostile pressure was between the Roye Road and the railway. He did not expect to be able to counter-attack until the 10th August owing to the losses he had suffered in artillery, and to the fact that the reserve divisions then coming up by bus were arriving without their artillery. He thought, however, that he had enough troops to stop any further hostile advance. He was expecting a big French attack from the direction of Montdidier—this attack did actually take place on the 10th of August. Prince Rupprecht's plan, as soon as he had troops available, was to make concerted counter-attacks against the flanks of the British advance. On the German right it would have to be made south of the Somme because there was not room for it between the Somme and the Ancre. On the German left it must be made from the direction of Roye towards Le Quesnel, as this was the part of the line where most danger was to be expected. It was where the main pressure of the British advance was being felt, and such pressure threatened the right and rear of the *Eighteenth German Army*. Prince Rupprecht was perfectly correct in fixing on this point as the most dangerous one to the German armies. He emphasised in his appreciation the necessity for not employing the reserve divisions piecemeal as they came up, and insisted that they must be used connectedly and together for the two big concerted counter-attacks. This was very sound in theory, but, as often happened during the war, it was not possible to carry it out in practice, and all the reserve divisions as they came up were put in piecemeal to stop up gaps.

As I have told you, five divisions (*243rd, 107th, 119th, 1st Reserve, 82nd Reserve*) had already been used up during the 8th, and for his two counter-attacks Prince Rupprecht would have available on the 9th one-third of the *26th, 21st, 5th Bavarian* and *38th* for the northern attack. These were well placed for the attack between the Somme and the Brie Road. In the south Prince Rupprecht had available the *79th* and *221st*, which were already moving up the Roye Road. The *Alpine Corps* had been promised him by 6 o'clock on the morning of the 9th, and later in the evening Ludendorff promised him three more divisions (the *121st*,

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6th Bavarian and *208th Divisions*) which were taken from such distant places as Laon, Verdun and St. Mihiel. They were brought by rail and were to be disembarked at and near Ham. These three divisions were to form a new corps under the *1st Bavarian Corps* headquarters. As a matter of fact the *6th Bavarian* and *208th* Divisions were switched off against the French, and the *1st Bavarian Corps* was made up of the *Alpine Corps* and the *121st* and *204th Divisions.*

On the 9th August the British objectives were Roye, Chaulnes, Bray, Dernancourt. This was a deep objective, but if things were to go as well as they did on the 8th of August there was no reason why we should not have advanced as far as this. But a mistake was then made, and I am quite certain that the first person to admit it would have been Lord Rawlinson. Our attacks on the 8th, as you have seen, were well concerted and on a wide front. Our attacks on the 9th August were disjointed. The real reason for this was that the Canadian Corps were allowed to fix the zero hour, whereas it ought really to have been fixed by Army Headquarters. What actually happened was that everyone was so busy congratulating everyone else on their share in the victory that valuable time was lost in preparing for an advance next day. If the Army had fixed the zero hour and had continued to press everyone to lose no time I can see no reason now why the general advance should not have been continued at 6 or 7 next morning. As we know now, the probability is, if this had been done, that the German resistance would have broken down completely and we should have reached the Somme during the 10th without much opposition. The lesson of this is an old one, and that is that once you have got your enemy on the run you must press on with every available man until exhaustion renders further pursuit impossible. The reason why the Canadians were allowed to fix the zero hour was that the main attack was to be made by them, while the Australians advanced in echelon on their left. The III Corps was to make an attack north of the Somme quite independent of the Canadian and Australian attack, and it was known would not be ready to attack till the afternoon.

What actually took place was as follows. The 4th Canadian Division attacked Le Quesnel at 4 o'clock in the morning and

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captured it. The 3rd Canadian Division then went through the 4th at 12 o'clock and reached Bouchoir at 3.30 in the afternoon. On their left the 1st Canadians commenced their advance at 1 p.m. They reached Warvillers and Beaufort by 3.30 and Rouvroy at dusk. Next to them the 2nd Canadians advanced at 11 a.m. with both their flanks exposed for two hours or more. They captured Rosieres and Vrely after some heavy fighting with the *119th German Division*, and with the aid of the cavalry reached Meharicourt that evening. North of the railway there was a delay in the arrival of the 1st Australian Division, which was brought up from reserve. The 5th Australians therefore made the initial attack against Vauvillers, which they captured at 1 o'clock. The 1st Australians passed through at 1.40 and attacked towards Lihons. They were not able to advance further than half-way up the Lihons Hill. Further north the 2nd Australians did not capture Framerville till half-past four. North of the Somme the III Corps did not attack till 5.30. Owing to the German resistance on the previous day there was a good deal of confusion and it was necessary to give time for an American regiment, the 131st, of the 33rd American Division, to be brought up. This regiment had to double for the last five minutes to enable it to arrive on the starting line in time for zero, and it then advanced headed by its gallant colonel. This American regiment was largely instrumental in the capture of the Chipilly Spur and the success gained by the III Corps on the 9th August. It was supported by the 58th and 12th Divisions. I have no doubt that lives could have been saved and a more satisfactory advance made on the 9th if the attacks of the various divisions had been properly co-ordinated; but even as it was a large further advance had been made and many more prisoners and guns captured.

The German side of the picture on the 9th is a very interesting one. At 10.15 on the morning of the 9th Ludendorff wired that a big French attack on the south might be expected. This was of course not very encouraging news to those who were already feeling rather uncomfortable. About 1 o'clock Ludendorff wired again to say that though he hoped to strike the enemy west of the Somme, he thought that preparations should be made for retirement to the line Bapaume—Peronne—Ham; that is, to the line

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of the Somme. This wire was apparently repeated to the *Second, Seventeenth* and *Eighteenth Armies.* How it was wired or in what form I cannot tell you, but its contents appear to have had bad results. Prince Rupprecht about 5 in the evening appreciated the situation as follows.

He thought that a continuation of the British attack was undoubtedly to be expected. He had few reserves left and would require more. He considered that the best place to which to send these reserves, and the best area in which to counter-attack, was just south of the Somme. He gave it as his opinion that unless there were reasons that he was not aware of he thought a stand should be made west of the Somme, and that our attack must be brought to a standstill west of the river. That was his opinion at 5 o'clock on the evening of the 9th, but it was apparently modified later on as you will see. At about half-past five von der Marwitz evidently began to feel very uncomfortable as regards the situation, and asked for more reserves. At half-past six the situation apparently appeared to him desperate. He reported that the men in the front line had ceased to fight and were incapable of further resistance. He considered that it was absolutely necessary for the *Second Army* to get behind the Somme, and proposed to do so. He would commence doing so that night. This was not at all to Prince Rupprecht's liking, and he replied that no retirement was to be made on any account. He pointed out that a retirement of the *Second Army* would place the *Eighteenth Army* in a desperate position; that the British attacks were growing weaker and were very disjointed—which was true; that the British had put in no reserves and that it was very doubtful whether they could do so. This prompt reply stopped any idea of retirement of the *Second Army*, but the panic had evidently spread south to the *Eighteenth Army*, because at 11 o'clock von Hutier also reported the situation as desperate and said that he must get behind the Nesle—Crozat Canal. He received the same reply from Prince Rupprecht as the *Second Army* had done. He was told that there was to be no retirement on any account and that the *Second Army* had been ordered to hold on, and therefore his rear and flank were safe. In order to ensure the safety of this flank the *1st Bavarian Corps* (*Alpine Corps, 121st* and *204th*) were moved up to near Roye, where

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they were ordered to cover the flank of the *Eighteenth Army* and to support the left flank of the *Second Army*, which was known to be somewhat demoralised. The *185th Division* from the *Seventeenth Army* was ordered south.

Prince Rupprecht's firm attitude apparently stopped the panic, but I have little doubt that if he had not taken up a very firm attitude both the *Second* and *Eighteenth Armies* would have gone back in confusion across the Somme. Whether this would have had any effect on the rest of the campaign it is difficult to say—probably not much; but the lesson remains.

On the 10th August the British objectives were the same as for the 9th, and again the Canadians did most of the attacking. The Canadian Corps had been given the 32nd Division as a reinforcement. The 3rd Canadian Division attacked Le Quesnoy at 4.20, and as soon as this place had been captured the 32nd Division passed through them and reached the outskirts of Parvillers and Damery. On the left of the 32nd, the 4th Canadian Division attacked at 8 a.m., the 12th Brigade against Chilly and the 10th Brigade towards Fouquescourt. From the commencement of the attack the opposition was severe, as the *1st Bavarian Corps* was opposed to them. In addition there was some heavy fighting all along the Canadian front, and Chilly was not captured till 3.30 in the afternoon. Further north the 1st Australians found the capture of the high ground around Lihons a very stiff task. They attacked at 8 o'clock in the morning under a barrage and captured Auger and Crepey Woods near the village after some very hard fighting. They were opposed by the *5th Bavarians* and later on by the *21st Division*. It was not until the evening that the Australians were firmly established on the high ground. The 2nd Australian Division covered the flank of the 1st. On each side of the Somme two night attacks were made. On the south of the river by the 3rd Australians, who captured Mericourt, and north of the river by the 4th Australians and Americans, who captured the Etinehem Spur. These attacks took place about 10 o'clock at night.

After what happened on the evening of the 9th August Prince Rupprecht evidently changed his mind, because on the 10th August he told the *Second, Seventeenth* and *Eighteenth Armies* that if the attack continued they would undoubtedly have to retire behind the

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Somme. He impressed on them that no mention of this was to be made to the troops; and that the instructions to the troops were that there was to be no retirement and that the present positions were to be held, but the staffs were to prepare a plan for retirement behind the Somme. From this it is clear that Prince Rupprecht had come round to Ludendorff's opinion that on the whole it would be best to place the Somme between them and the British advance. At 3 o'clock in the afternoon reports came in that there was no general attack in progress but that disjointed attacks were being made. Between 4.30 and 6.30 that evening the atmosphere in the German armies had changed. Both von der Marwitz and von Hutier sent in much more cheerful reports. They assured Prince Rupprecht that the morale of the men had been restored and that they could hold on, but would require some further reserves.

About 5 o'clock in the evening Prince Rupprecht again appreciated the situation, and his appreciation was an accurate one. As he viewed it there were two alternatives. One was a long drawn out offensive by the British on the present front; the other was for the British to close down the present attack and make a fresh one from a different direction, probably north of the Somme. He gave it as his considered opinion that in either case the best plan was to retire behind the Somme for two principal reasons. The first was in order to save man-power, which was already causing great anxiety, and the other was to enable the German armies to avoid surprise tank attacks. It is notable that from now on the Germans always tried to place a river or canal obstacle between them and our advance, so as to negative as far as possible our advantage in tanks.

On the 11th August the British attacks were closed down by common consent. It was obvious that further attacks would be very expensive, and the result would not be worth the losses we should incur. Up to date we had captured 24,000 prisoners and inflicted severe losses in killed and wounded at the cost of 27,000 casualties. Experience had taught us that the impetus of the attack had now died down and it would be folly to continue it on that front. Lord Haig gave orders for the attacks to cease and began to prepare for a fresh attack further north by the Third Army.

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At 4.30 p.m. on the 11th Prince Rupprecht reported to Ludendorff that the battle was over.

The main lessons of the battle I have attempted already to bring out. They are all old ones which you may read in Henderson's "Stonewall Jackson" or in his "Science of War." Though old they are interesting lessons, especially perhaps as regards the value of surprise and the influence of the individual leader. On the British side the influence of the commander is easy to trace. On the German side the incident of how Prince Rupprecht influenced the battle at a critical moment when his two army commanders wanted to retire is an excellent example. The fact that the man in command had made up his mind and was prepared to give definite orders changed the whole aspect of the situation. His more optimistic views spread downwards as they always will in such a case. This applies equally whether it is the commander of an army, of a division or of a platoon. If the man at the top is quite determined in his own mind on the action that he is going to take the spirit of determination will soon filter down to his subordinates.

CHAIRMAN: Does nobody wish to ask any questions? Gentlemen, it is getting late, and I will not detain you. First, if I may, I should like to welcome, in the name of the Regiment, the officers of the Imperial Defence College who have come to this lecture to-day. I think it is rather interesting that the first time that they should have come to a lecture here, they should have heard about a battle which was won by the Imperial Armies as a whole. Now I have no time and there is no necessity to add anything to the very excellent lecture you have heard. All the points that I could have made have been well rubbed in by Sir Archibald. We talk nowadays a great deal about mobile warfare but that is mainly a question of strategy; tactics always come down to the same old thing—fighting, and a lot of fighting, and in that respect I ask you just to compare the Battle of Loos, which has recently been described in the official history of the War, with the battle which Sir Archibald has described to-day, and which I think you will find in the History of the 4th Army which he himself compiled. I will not add anything to that. It is worth while

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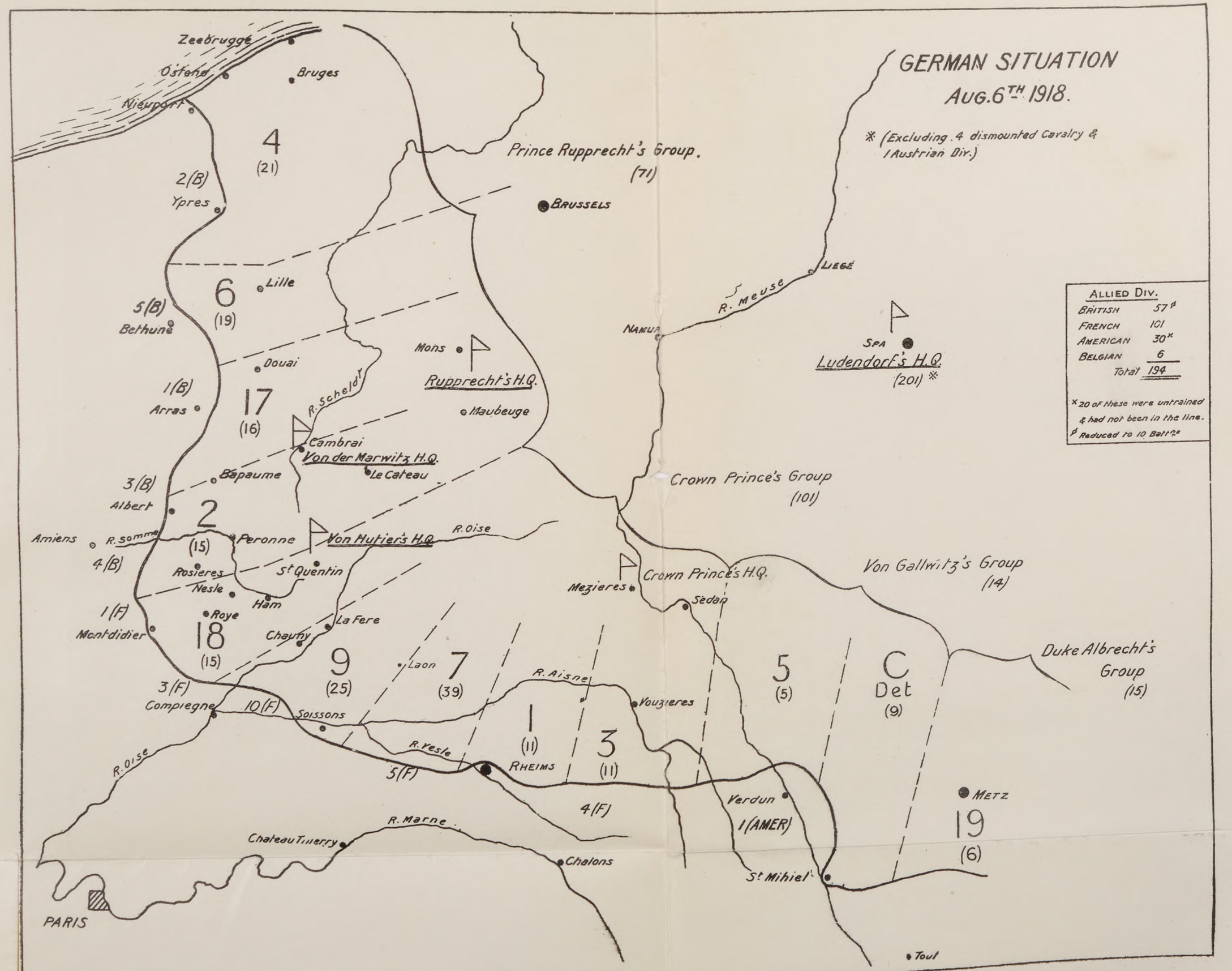
SKETCH 1.



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SKETCH 2.

Map showing EMPLOYMENT OF GERMAN RESERVES on 8th, 9th & 10th Aug. 1918.

BRITISH OBJECTIVES, AUGUST 8TH.

1st Objective (green line)
2nd ,, (Red ,,)
3rd ,, of Australian Corps (blue line)
3rd ,, or Canadian Corps } line of exploitation } × × × × ×

Yards 2000 1000 0 2000 4000 6000 8000 10,000 Yards

17TH ARMY (16 - Div.) Otto Von Below

ALBERT
Dernancourt
Portion P.M. 9th Aug.
Morlancourt
Portion P.M 8th Aug.
Bray
R. Somme
Tailles Wood P.M. 8th Aug.
Ethinehem
Chipilly
Mericourt
Corbie
Hamel
Cerisy
Night 7/8 Aug.
Morcourt
Proyart
8PM 8th Aug.
From Amiens 10 miles
Warfusee
Foucaucourt
Estrees
P.M. 8th Aug.
Villers-Bretonneux
Bayon Villers
Framerville
Harbonnieres
Vauvillers
Marcelcave
Wiencourt
Guillaucourt
Ignaucourt
R. Luce
Hangard
Demuin
Cayeux
Caix
Damart
Hourges
Rosieres
Lihons
5 Bav.
P.M. 9th Aug.
Chaulnes
Vrely
119
Meharicourt
P.M. 8th
Beaucourt
Mezieres
Morcuil
Warvillers
Beaufort
Chilly
Le Quesnel
P.M. 8th Aug.
Rouvroy
Fouguesscourt
Fransart
1 R.D.
79 R
P.M. 9th Aug.
Parvillers
10th Aug.
1 BAK C
Alpine Corps
121
204
Damery
Hangest
82 R.D.
Bouchoir
Le Quesnoy
P.M. 9th Aug.
Nesle 9th Aug.
Ham
Roye
R Avre
LINE EVENING OF 8TH AUG.
LINE EVENING OF 9TH AUG.
LINE EVENING OF 10TH AUG.
PERONNE
Flaucourt P.M. 8th Aug.
Brie
P.M. 8th Aug.
Villers Carbonnel
21
10th Aug.
38
10th Aug.
5 Bav
26
9th Aug.
XIV C
XI C.
XXXI F
III C
18th Army (15 Div.)
Von Hutier
I A
2 A
2 C
4 A
4 C
5 A
1 C
3 A
3 C
1 A C
14 Bav.
192 (not opposed to British)
225
109
117 night 7/8th Aug.
108 Night 7/8 Aug.
243
107
8PM 8th Aug.
221
10th Aug.
33 A.m.
R. Ancre
54 R
27
58
43
41
13
47
233
12
18

2ND ARMY (15 DIV.)

Von der Marwitz.

In line & relieving night 7/8th * 12 Div.
(in 2nd Army Reserve on 8th 3 Div.)

Reinforced 8th Aug. by

243	* 2nd Army	5 Div.
107	* ,, ,,	
119	18th ,,	
82 R	,, ,,	
1 R	,, ,,	

Reinforced 9th Aug. by

26	17th ,,	4 Div.
5 Bav	,, ,,	
79 R	9th ,,	
221	17th ,,	

Reinforced 10th Aug. by

21	* 2nd ,,	5 Div.
38	6th ,,	
Alpine C	4th ,,	
121	9th ,,	
204	18th ,,	

Reinforced 12th Aug. by 185 17th ,, 1 Div.
Total 27 Divs.

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studying these two battles, one at the beginning of the war and the other at the end, and you will see at once the extraordinary difference in the way they were conducted. Of course, as Sir Archibald pointed out, the first essential in war, as proved by all the great captains, is surprise; and to my mind it was marvellous how it was possible to carry out a surprise in that country, which I suppose some of you know, and which to my mind is certainly one of the most difficult bits of France in which to hide troops.

The lecturer referred to certain points and I have put some of them down in my notes. The first, the most important thing in the army, is generalship, power of command. Then comes that loyalty of the troops to their superiors which was so extraordinarily marked in the 4th Army. It is especially interesting when we come to personality. Why was the loyalty of the troops so great. Was it not on account of the generalship and the personality of the general in command? I say no more, but if you want to read a good biography of a soldier, with not a nasty word said in it about anybody else, read the life of the late Lord Rawlinson. Then there is staff work and I think the Regiment can be very proud indeed of the staff work of that battle because the chief staff officer concerned was a gunner who left this very place, Woolwich, in 1914, with the 4th Divisional Headquarters; he is the same officer to whom we all owe a very deep debt of gratitude to-day for having come down and given us this lecture. We thank you very much. (Applause.)

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BATTERY TACTICAL TRAINING.

A study of Artillery Training, Vol. III (1928).

By Bt. Lieut.-Col. E. C. Anstey, d.s.o., *p.s.c.*, R.A.

PART (2).

Defence.

THERE is one change of doctrine in the new Artillery Training, Vol. III, of overwhelming importance. In the 1921 edition (p. 161) it was stated that the machine guns must be co-ordinated with the artillery. The 1928 volume, in Sec. 36. 3, lays down on the contrary that the artillery fire plan must be co-ordinated with that of the infantry. This important principle is elaborated in Infantry Training (Sec. 21. 6) in the following manner:—"The machine gun is the most valuable of all the weapons used in defence against infantry; so long as it is in action the area of ground swept by its fire is rendered practically impassable by infantry. The artillery fire plans, the siting of the infantry defence works and the placing of wire obstacles, if available, must therefore all be co-ordinated, as far as possible, to force the enemy into the arcs of fire of the machine guns."

When we remember the rigidity and flatness of the machine gun's trajectory compared to the flexibility of that of the howitzer and to some extent that of the 18 pr. with its reduced charge, we must recognise the soundness of the decision to subordinate the artillery to the machine gun in the defence.

Having directed attention to this fundamental change, it is desirable to turn to the chapter on defence in the new volume and deal with it in sequence.

In conjunction with Sec. 30 it is well worth studying the opening sections of the corresponding chapter in Vol. II of Infantry Training where the general considerations regarding the organisation of a defensive position are most admirably dealt with. It should be noted in passing that it is laid down as an axiom (Infantry Training II, Sec. 19. 2) that as long as Infantry remains unshaken by artillery fire or tanks it can, given good visibility,

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repulse an attack with its own weapons. It is particularly desired to call attention to Sec. 20. 4 of the same volume where the procedure for the occupation of a defensive position in mobile warfare is admirably sketched out.

It will be seen that the first step is the selection of the general line of the foremost defended localities designed to protect the artillery observation zone, but not the selection of the defended localities themseleves. Before that is done the artillery and machine gun fire plans have to be designed within brigade and battalion sectors, primary attention, as we have already seen, being given to the machine guns. Then comes the siting of the defended localities in relation to those plans; and finally the placing of the reserves.

It is obvious therefore that when the divisional commander, with the assistance of his C.R.A., has decided on the general line of defended localities, he can do no more at that moment towards the formation of a fire plan since the fire plan is going to depend altogether on the machine guns. As the 1928 volume says, the outline of the artillery plan is communicated early to subordinate artillery commanders, but the "details of the artillery fire plan for the defence of the various sectors will be arranged between artillery brigade commanders and the commanders of the troops allotted to these sectors." It goes on to say that when time permits the higher commanders will co-ordinate these arrangements.

So we see that the procedure for the production of a fire plan in the defence is exactly the opposite to the procedure for its production in the attack. In the attack the C.R.A. lays down the ground work of the fire plan in accordance with the plans and wishes of the divisional commander. Often for the first phase they can make the fire plan in considerable detail when the enemy's foremost localities have been determined. As a result of their reconnaissance the brigade commanders add more detail with the assistance of the artillery supporting them and of that under their orders; while the battalion commanders round off the fire plan by the co-ordinated action of their machine guns, close support guns, and supporting batteries. The foundation is laid down by the higher command and a plan is erected on it. But in the defence the exact opposite is the case. The detailed targets which form

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the basis of the plan are settled in battalions and batteries and their proposals are then co-ordinated by their superiors. This refers particularly to that portion of the plan known as "co-operation with other arms in repelling the assault."

The truth of these statements may not be immediately obvious on reading Artillery Training. But they become so if Artillery Training is read in conjunction with Infantry Training. Artillery Training III, Sec. 32. 2, points out, as already quoted, that the details of the fire plan have got to be arranged with the commanders of the various sectors. Infantry Training II, Sec. 20. 4. iii, carries these sectors down to battalions. Artillery Training III, Sec. 40. 2, says that if practicable the artillery brigade zones should correspond to the infantry brigade zones. It then goes on to recommend that the artillery brigade front should be subdivided amongst batteries, and it is legitimate to deduce that when practicable the battery zones, or some of them, should correspond with battalion zones. This deduction is confirmed by a study of the procedure by which the infantry develop their plans. Infantry Training Sec. 21 makes this clear, especially when we are told (Sec. 21. 6) that "The artillery fire plans, the siting of the infantry defence works, and the placing of wire obstacles, if available, must therefore all be co-ordinated, as far as possible, to force the enemy into the arcs of fire of machine guns."

Thus you have the groundwork of a defensive fire plan being laid down either by infantry and artillery brigade commanders when time is available, or by battalion and battery commanders in cases of urgency. What form should their defensive fire plans take?

The new manual deals with this in Section 32. It divides the artillery portion of the plan into

(a) Counter-battery work.
(b) Harassing fire.
(c) Counter-preparation.
(d) Co-operation with other arms in repelling the assault.
(e) Anti-tank.
(f) Support of counter-attacks.

Of these, the battery officer is mainly concerned with the last four.

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Let us take the case of a battery commander working in conjunction with a battalion commander in a battalion sector and consider how he should set about the task.

Method is essential to rapidity and efficiency. In broad outline the method recommended is to deal with the above sub-heads (d), (c), (e) and (f) in that order.

The plan for repelling the assault.

To set about making this, you require to know what ground is going to be swept by machine-gun fire and by infantry fire (i.e. where the tactical localities are going to be), for one of your tasks will be to "deny certain approaches to the enemy and so force them into areas which are covered by infantry and machine-gun fire." (Artillery Training III, Sec. 36. 3). Further your defensive fire is to be "directed on the assaulting troops and reserves" (Sec. 36. 1). For this you have to forecast where the enemy is most likely to attack. That is for the infantryman to study and not for the gunner to decide.

Now Infantry Training lays down, as has already been quoted, that infantry can defend themselves with their own weapons, provided that their machine guns remain in being and that their riflemen are unshaken. This is the logical corollary of the insistence of our doctrine on the absolute necessity for fire superiority before launching infantry to the assault. It follows that the first task of the artillery of the defence should be to ensure that its machine guns remain in being and its riflemen are unshaken. Thus the targets of primary importance must be the enemy's covering weapons. Counter-battery is not normally the duty of a divisional artillery. But the enemy's supporting machine guns and his forward observation posts are the field artillery's tasks. Consequently our first business, in conjunction with the infantry, should be to see whether these targets can be foreseen.

In very many cases such questions are not difficult to answer. The infantryman who studies his sector from the enemy's point of view looks first for the most suitable positions from which an advance can be covered. These suggest the possible enemy plan of movement, his forming-up places, and lines of approach. Thus it is the infantryman who points out to us the most important

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artillery targets, i.e. the covering fire positions, the likely observation posts, the forming-up areas, and the lines of approach. As regards the observation posts, the gunner can of course contribute usefully his forecast when he knows the enemy's probable alternative plans of movement and consequently the ground over which he will require observation. Finally we wish the infantryman to indicate the ground he thinks most likely to be used by the enemy at night, and the data for the selection of targets is complete.

Such are the lines on which the "consultation with the commanders of sectors" referred to in Sec. 36. 1, should run.

A considerable number of targets will have thus been selected and it is obvious that the artillery cannot deal with them all simultaneously. It must be noted that the batteries are to be prepared to engage targets "as required by the troops they are supporting" (Sec. 42. 3), and that arrangements are made for "concentrating fire on any given portion of the front" (Sec. 36. 4).

These objects can be attained, and the difficulty of indicating targets in the heat of battle surmounted, by giving each of the targets that have been selected a letter and a number, the list being then supplied to the infantry and to the artillery commanders. If fire is required on an area that does not correspond with a selected target the nearest target can be used as a reference point.

The next step must be to determine in consultation with the infantry :—

(a) The artillery night lines.
(b) The day targets of primary importance.
(c) The targets on which it can be forseen that additional fire to that immediately available may be required.
(d) Targets recommended for engagement during the counter-preparation period.

The selection of the targets (c) is most important for upon this depends the building up by the brigade and divisional artillery commanders of the full fire plan.

For example. One of the targets of the right brigade, named "R 10" is the axis of a likely line of enemy approach. If on the development of an attack it is evident, judging from the weight of the enemy's covering fire, that the centre of gravity is on that line, it will be desirable to add the fire of another battery to extend the

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front covered. The target then becomes "R 10 a". To concentrate the fire of a whole brigade the indication becomes "R 10 b"; and so on.

Provided with suggestions on these lines, battery commanders, having completed their reconnaissances with their associated battalion commanders, meet their artillery brigade commanders who, in conference with the infantry brigade commander, decide on the targets they will be prepared to build up fire upon and on the allotment of their portions of the target to each battery. They then decide on the further fire they would like to ask for in case more support is needed and these suggestions are placed before the C.R.A. and divisional commander who are thus enabled to complete the divisional fire plan. In this manner can the requirements of our manual be fulfilled, namely, that the artillery tasks should be based on the machine guns, siting of tactical localities, and the placing of wire obstacles; that plans are framed to deal with an attack along the whole front as well as with an attack on a portion of it (Sec. 35. 3); that arrangements are made for concentrating fire on any given portion of the front; and that the infantry are assisted in indicating where they would like fire put down. It will be readily appreciated that this can only be done by building up the fire plan from below, as sketched above, instead of filling it in from above as is done in the attack.

The artillery fire plan, accordingly, takes the following shape:—

1. The night lines for each battery.
2. The primary targets for each battery when counter-preparation is ordered.
3. The primary targets for each battery when an assault is threatened.
4. A list of other targets, indicated by letters and numbers, allotted to batteries upon which they are to be prepared to turn their fire.

Such is the procedure for the production of a fire plan when time is available. Battery positions are not chosen until the plan has been formed, for, until you know where you are required to put your shell, you cannot place your guns with certainty. As the time available shortens, so must the procedure be varied.

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Variation in procedure when time is limited.

When the threatened action of the enemy, or the approach of nightfall, hastens the occupation of a position, it is important that the necessary work at battery positions and O.P's should begin at the earliest possible moment. In many types of country however a battery ordered into action before its tasks are known may be unable to perform them when they are allotted. Such premature action should be avoided whenever possible. Often little time will prove to be lost if the battery is ordered into a position of readiness while the gun position officer and the battery leader accompany the battery commander in his reconnaissance with the infantry. As soon as the tactical localities are known and the machine-gun fire has been so far planned that the battery night lines or target of primary importance can be selected, those officers can be sent off to bring the battery into action and make the necessary preparations for dealing with the targets chosen. The remainder of the reconnaissance can then be completed.

The type of defensive problem that calls for the most rapid action of all is that of consolidation at the close of an attack.

Consolidation.

By consolidation we mean "organising the . . . . objective . . . . against possible counter-attack" (Infantry Training II, Sec. 6. 7). Infantry training also points out (Sec. 13. 25) that usually after a successful attack there is a short period of quiet during which minor adjustments can be made; that the battalion commander's first duty is to select a temporary defensive position, relying largely on the cross-fire of machine guns disposed in depth; and that usually careful organisation cannot be carried out in its entirety until after dark.

It follows that from the moment of your arrival with the battalion commander on the captured position the situation presents itself in two phases. The first covers that appreciable time during which the infantry are not ready to defend themselves with their own weapons, their machine guns not being up and their riflemen and Lewis gunners being disorganised and not yet in properly selected fire positions; and the second phase which begins when they are so ready.

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That is what differentiates the problem from that of the occupation of other defensive positions. Your battery is still in action and the means for the establishment of an O.P. at hand. The need for speed is so great that it must be established at the first favourable spot met with, for registration has to be carried out at once. The points for registration require immediate decision.

Broadly speaking this decision rests with the battalion commander. He does not, of course, pick the actual spot on the ground that you are going to register. But he does decide the order of importance of the tasks he may ask you to perform. These may be :—

(a) To engage at once machine guns that are prohibiting or incommoding any readjustment of his battalion.
(b) To fire on the area over which he most fears a counter-attack before his men are ready to receive it.
(c) To fire on the supporting positions, lines of advance, etc., of a counter-attack when his dispositions are as complete as he can make them.

Consequently the type of target on which it is wrong to fire, tempting though it may be, is retiring enemy whether disorganised or not. For the moment they have no tactical significance. There is not a moment to lose in registering the targets that may be in, say, twenty minutes time of the greatest tactical importance.

When counter-attack seems possible from more than one direction, it must be for the battalion commander to say which area he would like registered first.

Defensive problems on the sand model.

The sand model can be employed usefully.

(A) To teach elementary infantry tactics in the defence that are important for battery officers to understand.
(B) To illustrate the selection of artillery targets in the defence.
(C) To teach the part played by artillery in the consolidation of a position.

The infantry company in the defence.

Adopt such a scale that the width of the model is from 800 to 1000 yards. Arrange the ground so that there will be two lines of

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approach uncovered by machine-gun fire. Cut strips of paper to represent the beaten zones made by a subsection of machine guns at 1000 yards, i.e. 10 yards wide by 300 yards in length. These are good average figures for the gunner to remember. At shorter ranges of course the zone is longer, and at increased ranges (up to a point) they are shorter. Cut out from paper also to scale strips representing two ten-yard bays of a trench with a five-yard traverse between them, marking half of them "L.G." for the Lewis gun sections. Given a company area, the general position of the neighbouring localities, and the strips laid on the model to represent the machine-gun fire that has been arranged, a useful exercise can be made of placing the company by sections on the ground. Infantry Training is very clear on the subject. Remember that the placing of the platoon localities is determined by their Lewis gun tasks which are to cover the gaps in the machine-gun fire. The manner in which platoon localities are organised is explained in Sec. 23 of Infantry Training. All-round defence is obtained, not by placing the men so that they face in all directions, but by having fire positions prepared from which fire can be delivered in any direction.

Illustrating the selection of targets.

The useful illustration of types of artillery targets in the defence depends of course on the arrangement of the model to show different types of ground, including villages, enclosed country, defiles and so on.

To deal instructively with consolidation problems on the model the most important thing is to paint a full and true-to-war picture of what the battery commander sees when he reaches the captured position. Do not omit what he sees on the flanks, both of his own troops and of the enemy; what he saw on the way up such as casualties, and particularly forward movements of reserves and machine guns that were in progress. Paint accurately not only what he can see of the enemy but also what he can hear of guns and small arms firing and shells bursting. This instruction can be well combined with that of fire control by treating the model as a miniature range and bringing in a counter- attack to be engaged after a certain amount of registration has been done.

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Advanced guard artillery.

This section (46) in the new volume is clearer than in the old. There was no mention of any artillery being with the vanguard in the 1921 edition. We are now told that "Some field or light artillery may be placed with the vanguard if the situation requires it." This in its turn is an addition to Infantry Training which only includes light artillery in the vanguard (Sec. 28. 7). It will generally be found in practice that when the vanguard is of the size of a battalion the allotment of a battery to it is advisable.

The next ruling to notice (Sec. 46. 3) is that an artillery patrol is to be sent with the vanguard. Nothing is said about the duties of this patrol or the manner in which they should be carried out.

Satisfaction will never be obtained from a patrol of this nature if it is given a roving commission. It will never be forthcoming when required. If useful information is to be received at the right time and place, definite questions must be asked of the patrol just as they are asked of the cavalry. Now we know that an advanced guard is given a series of objectives to be gained during the day's advance and that the advanced guard commander decides from the map certain important points of tactical importance that he must secure in a series of bounds (Infantry Training II, Sec. 28. 9). If the enemy is found on any of these lines he will have to be attacked vigorously. We want to know therefore what artillery positions and likely areas for O.P's exist for the support of attacks on these important points. If the patrol moves well forward it will have time to find the answers before the advanced guard artillery commander comes up. If it is found that the enemy have not forestalled us on one of these bounds, the patrol can at once move forward to the next without waiting to report to his commander. A meeting place on the road should be fixed before reaching each bound at which the report, if one proves necessary, is to be made.

In the old volume it was recommended that batteries or sections should move forward by bounds so that some artillery support would always be forthcoming. It was not clear however when this system should start. Sec. 46. 4 now explains that guns need not be put in action until contact is gained or, as Infantry Training II, Sec. 28. 10, puts it, when the infantry, who have hitherto been marching along the road, deploy into some such

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formation as the diamond, square or triangle. It will probably be sufficient in the first instance for the battery with the vanguard alone to take up a position of observation. Sometimes it may be thought enough for one section to be so employed.

Rearguard artillery.

Section 48 of the 1928 volume is quite new, has been much expanded and merits careful study. It is well known that the control of a rearguard is one of the most difficult operations of war. Unless the principles now laid down are very clearly understood confusion is bound to result.

A study of Sec. 48. 5 shows that artillery with a rearguard has three different roles to perform for which different batteries must be allotted.

A. Horse or mechanised batteries supporting the rearguard mounted troops.

B. Batteries delaying the enemy with long-range fire under cover of the mounted troops, i.e. without any infantry escort.

C. Batteries supporting the infantry of the rearguard when forced to deploy.

The longer these batteries can continue in the roles allotted to them, the less confusion will result. In an emergency of course those under B may have to adopt role C. In the case of a rearguard of a strength of an infantry brigade with a brigade of artillery (excluding any guns allotted to the cavalry) when the rear party probably consists of a battalion it will often prove suitable to detail one battery to move with the rear party to support it; one to move just ahead of the rear battalion of the main guard to support it when it has to deploy; and to use the other two batteries for the long-range delaying fire, leapfrogging one another in turn. This initial distribution, it will be seen, fits in well with the various phases of the retirement.

If Infantry Training II, Sec. 30. 6 *et seq*, and Artillery Training III, Sec. 48, are read in conjunction it will be seen that these phases number six.

Phase 1. Enemy being delayed by the R.A.F., rearguard mounted troops, and artilleries A and B. Remainder of rearguard on the march.

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Phase 2. Rear party deployed; mounted troops and artillery A probably on flanks; artillery B continuing long-range fire. One battery of artillery C in action.

Phase 3. Rearguard deployed; front divided into sectors; all of artillery C now in action.

Doubtless the rearguard commander will hope that circumstances will allow him to hold the front with two battalions and to occupy the next position with his other two battalions. The allotment of artillery suggested above fits in neatly with the two battalion sectors (a battery in each sector) and complies with Artillery Training III, Sec. 48. 9, which says that "normally a portion of the available artillery should be detailed to support each infantry formation and unit holding part of a rearguard position.

Early in this phase the batteries B will be close up to the infantry positions in order to develop their long-range fire and will therefore be incorrectly placed for supporting work. Hence the importance of their maintaining their roles.

Phase 4. Bulk of infantry withdraw covered by batteries C who are covering the rear parties in each sector.

Phase 5. Withdrawal of the rearmost artillery (Artillery Training, Sec. 48. 7), i.e. artillery B.

Phase 6. Withdrawal of the rear parties under cover, say for the first 1000 yards of their movement, of their supporting batteries who then slip away.

Battles seldom go as planned and many variations may occur to the above. But it can be seen that the longer the roles of the various batteries can be maintained the more chance is there of the different tasks being efficiently performed.

Outpost artillery.

As regards outpost artillery there is a feature of their work not mentioned in the manual that is worth bearing in mind. The problem presented to them differs from a defensive problem in one important particular. An outpost plan contains provisions for eventual retirement when the main body is ready to receive attack. Consequently the artillery are asked to carry out conflicting tasks—to develop long-range delaying fire or to help cavalry back, and to cover the withdrawal of the infantry. At some time, therefore,

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movement from the positions required to carry out the first role will have to be made to those positions from which both the defence of the outpost front and the support of its evacuation can be performed.

Advanced guard and rearguard problems on the sand model.

If a road is laid out on the model diagonally from corner to corner and a small scale is chosen, the distribution of an advanced guard from the leading cavalry patrols back to the mainguard can be usefully demonstrated. The deployment of the infantry and the movements of the batteries can be easily worked out.

Similarly the roles of artillery in a rearguard can be well shown especially if discs of different colours are used to represent batteries fulfilling roles A, B and C.

Since the necessity for the increased study of tactics by battery officers was the object of these articles it is not proposed to refer to further portions of Artillery Training III. It must be noted, however, that the chapter on ammunition supply is new and deserving of study by all.

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DOES RADIO TELEPHONY OFFER A POSSIBLE SOLUTION TO THE MAIN ARTILLERY PROBLEM OF THE DAY?

By Captain W. C. Holden, D.S.O., M.C., R.A.

Part II.

IN a previous article the requirements of artillery as regards radio communication were discussed. The enormous field for the development of artillery tactics which would result from the introduction of suitable means of radio communication, was disclosed. What we now require is an apparatus sufficiently portable and reliable to be used on the battlefield and having sufficient range to bridge the gaps over which communication is required. The day has arrived when the provision of such equipment is a practical proposition. We have seen the results obtained with experimental equipment carried in extemporised transport and operated by novices with little knowledge of maintenance and radio procedure. We have also seen to what extent radio has developed in other spheres of utility. Its application to artillery purposes is not a very difficult technical problem. It is essential, however, that the gunner should say what he wants, instead of asking the expert what he can give. To be able to do this, requires some experience in the employment of radio and a certain amount of insight into the technical problems involved. It is felt that the recent issue of a number of experimental sets will do much in this direction, and that the experts will be given a definite guide as to our requirements.

It is the intention of the writer to touch on certain of the technical aspects of the use of radio as outlined in the previous article in the hope that it may help readers to form an appreciation of the possibilities and limitations of its employment.

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1. *The problem of congestion.*

Whenever a wireless set is produced for military purposes, one of the first questions which is asked is "How many can be worked simultaneously in a given area." The answer depends on many factors. It is fundamentally a matter of what is termed "wavelengths." In order to enable any system of radio communication to work, whether it be for co-operation with aircraft, or between troops on the ground we find ourselves laying down in orders the "wavelengths" on which particular stations are to operate. It is necessary, therefore, to go into this question of wavelengths in a little more detail to be able to appreciate the limits of radio in a congested area. It is proposed, for the sake of those who have little knowledge of wireless, to explain a few of the elementary principles of radio communication.

Within limits, wireless waves can be generated from the aerial of a transmitter at any desired frequency. These waves spread out into space at a constant speed of travel. Consequently, by altering the frequency at which the waves are generated, the intervening distance between the waves can be altered to any desired amount. This distance is known as the wavelength.[1] The process of adjusting a transmitter to send out waves at a desired wavelength, is known as tuning the transmitter. In practice, a tuned transmitter does not confine itself to the emission of waves of exactly the wavelength required. It actually sends out a number of waves including waves slightly longer and shorter than the desired wavelength. In fact it monopolises a small "band" of wavelengths. The strongest waves however, are those at the centre of the band, and the others fall off in strength as they approach the edges of the band. The breadth of this band is sometimes referred to as the sharpness or flatness of the tuning of the transmitter. Similarly, a receiver can be tuned

[1] The wavelength in metres corresponding to a frequency (in kilocycles per sec.) is given by the formula

$$\text{wavelength} = \frac{300{,}000}{\text{frequency}}.$$

The tuning of a station can therefore be given either in "frequency" or in "wavelength." For most technical purposes it is more convenient to speak of "frequency" instead of "wavelength." To eliminate interference between two telephony stations, for example, the stations must have a frequency difference of at least 10 kilocycles. While in England we usually refer to a station as working on a certain wavelength, in America and elsewhere its frequency in kilocycles is usually given.

A table of wavelengths and frequencies is given in Appendix I to Signal Training, Vol. II, Part II.

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so that it will reject all waves except those at approximately the desired wavelength. A sharply tuned receiver will accept only a very small band, whereas a flatly tuned receiver will accept a wider band of wavelengths. The breadth of this band of wavelengths, over which the signals from a transmitter spread, bears directly on the question of radio congestion. In the case of telegraphy this band can be reduced to very narrow limits. In the case of telephony it must be comparatively wide, since the effect of impressing speech on a "carrier" wave of a certain wavelength is to cause a complex fluctuating wave to be sent out which is composed of a band of wavelengths.

The practical result of this is that telegraphy is about four times as economical in wavelengths as telephony. In other words, from wavelength considerations alone, it is possible to work at least four times the number of telegraphy sets in an area as compared with telephony. We see then, that even if telephony is to be considered normal for artillery purposes, occasions will arise when congestion is such that it will be necessary to resort to telegraphy. This congestion might be caused by the bunching of our own stations or by enemy interference. It is essential therefore that your R.T. sets should always incorporate the means to change over to a selective form of telegraphy.

In discussing the question of congestion, there is the effect of the standard of training of operators to be considered. A good operator will more often than not, get signals through when an indifferent one has failed to do so. The standard of training of the R.A. signallers will also be an important factor in the design of our equipment. Taking a receiver, for example, there are two factors which, to a great extent, are very hard to reconcile—selectivity and simplicity of manipulation. In design there must necessarily be a compromise. Generally speaking, a flatly-tuned receiver is easy to handle, but it is of little use in a congested area. Many receivers have the means to adjust their selectivity, to some extent, but it is in the nature of a complication. If it can be shown that the R.A. can produce a high standard amongst their operators, not only will better results be obtained with any particular equipment, but it will enable the designer to give us something better still. In the Regiment we have a large field to choose from and

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there is no reason why we should not have an ample number of well-trained operators of the best type.

2. *The question of the artillery waveband.*

Wireless waves of length varying from 5 metres to 30,000 metres are used for the purpose of radio communication. It is convenient to classify them in groups as long, medium, short and ultra short. The terms of course are purely relative and the points of division on the scale arbitrary. We may, for the purpose of considering their peculiarities, call the long waves those above 1000 metres, medium waves 1000 to 100 metres, short waves 100 to 15 metres, and ultra short all those below 15 metres.

For artillery purposes a band amongst either the short or ultra short waves has great advantages. First of all only a very short band—as measured in wavelengths—is required to enable us to use all the sets we need in the battlefield. To exemplify this by figures, between 900 and 1000 metres it is possible to work three telephony stations without mutual interferences between their speech waves, between 90 and 100 metres it is possible to work 33 stations, and between 9 and 10 metres it is theoretically possible to work 333 stations. Practical difficulties, however, preclude the use of such a great number between 9 and 10 metres, but nevertheless, quite a considerable number can be used in this short wave band. Therefore, in a congested area, it is obvious that we must use a comparatively short wavelength. (Technically a band one metre wide at about 10 metres, is a very wide band indeed.) The short and ultra short wavelengths moreover have the advantage that a small aerial, for both receiving and transmitting, is very efficient—an important factor with artillery sets. Again, wireless communication on the shorter waves is not adversely affected by atmospheric disturbances to the same extent as in the case of the longer waves. In India and Egypt for example, communication on the longer waves at normal distances is quite impossible on many days during the summer with the limited power available. The relative strength of the unwanted atmospheric disturbance to the desired signal is much greater on the long waves. On this ratio depends the clearness of signals, so that medium or long waves would not be suitable in tropical climates.

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There is one peculiar phenomenon about the shorter waves which is of interest. They are easily reflected in a similar manner to the rays of light. By a suitable arrangement of reflecting wires the waves can be concentrated in a beam so that they travel mainly in one direction. It may be practicable in the future to make use of this to obtain some measure of secrecy and to eliminate interference in the field, as well as to reduce the power needed. This has already been demonstrated with our commercial "beam" stations. In the case of the ultra short waves this reflection is so great that it may be difficult for direction-finding apparatus to locate a transmitting station as the rays, reflected from trees and other objects, may reach the direction finder almost as strongly as the direct ray.[1] This is an advantage. The disadvantage of this reflection is that the waves travelling from the transmitter to the receiver are attenuated by the dissipation of energy caused by intervening objects. A certain amount of care is therefore necessary in siting the sets.

An important point about using the ultra short waves, is that at present a receiver listening on these waves is very much interfered with by the magneto firing arrangements of a petrol engine which is running somewhere near. This precludes the reception of signals with a set carried on a petrol driven vehicle while the vehicle is on the move. Whether means will be found to screen the electrical equipment of the vehicle or not, it is impossible to say. It seems to be a very difficult problem as the combination of magneto, sparking plugs and leads act as a form of flat tuned ultra short wave transmitter. If this trouble cannot be obviated, and we are content not to use our sets on a petrol-driven vehicle on the move, it seems probable that, in the clamour for wavelengths, we shall find ourselves the sole possessors of a band of wavelengths which would be entirely unsuitable for our rival claimants—the Royal Air Force, and Royal Tank Corps. It would be a satisfactory solution to the problem so far as the Regiment is concerned.

[1] It should be noted that the phenomenal distances of thousands of miles obtained with short waves using small power, is due to the reflection by the upper layers of the atmosphere, of those waves which travel upwards from the transmitter. At the distances (i.e. 5 to 10 miles) with which we are concerned, only those waves which travel more or less horizontally can be used. These are reflected and absorbed by terrestial objects. The state of affairs with a short wave transmitter may be such that signals are very strong up to 5 miles, completely absent at a point 15 miles away, but very strong again at 1000 miles or so.

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3. *The number of "clear" wavelengths required by the artillery.*

The number of sets which can be used simultaneously for artillery communications will depend, in the first place, on the size of the band which is to be allotted exclusively for artillery purposes. Other branches of the army, as well as the other services, all require their share of the wavelength scale. There seems to be no technical reason why a sufficiently large band should not be allotted to provide all the essential communications that are needed by the artillery. At this point it is well to emphasise that, even if we are given sets a large number of which can be worked simultaneously, with small wavelength differences between them, *inter-communication will always be more certain and more quickly established if the number of wavelengths in use is reduced to the absolute minimum.* This fact should be the first consideration in the organisation of all radio inter-communication systems for every operation.

A further point to be considered is, that when more than two stations are working on the same length, e.g. in the case of a brigade H.Q. cutting into a battery—O.P. wavelength in order to give the battery or its O.P. a message; or in the case of a brigade H.Q. working to all the batteries on a common wavelength; a very high degree of what might be termed "wireless discipline" and knowledge of wireless procedure is necessary on the part of all operators, otherwise confusion will result. It should, however, be possible to bring our operators up to the required standard, but one must not expect to be able to use elaborate networks of stations working on common wavelengths. Extensive common wavelength working may be possible in the other services where the signaller is an expert, trained from boyhood, and kept continually at his own particular job.

In the previous article 13 or 14 clear wavelengths were considered adequate for a divisional artillery. It is quite possible to design a set, covering a small wave band which would allow 13 or 14 stations to work without mutual interference. However the question of the flanking divisions must be taken into consideration, as each of these requires 14 wavelengths as well. To overcome this difficulty, a total of 28 wavelengths may be required, of which 14 could be used by the centre division and the remaining 14 by the

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two flanking divisions. As they will be using the same wavelengths, if the flanking divisions are not sufficiently far apart mutual interference will result. This will only happen however with abnormally short frontages. All the same this consideration may set a limit to the power to be employed. If the sets have a great range, divisions working on the same wavelengths may have trouble however far apart they may be. The problem however is one for practical experiment.

We have now given the expert something definite to work on. It may be necessary for the artillery to obtain a wider band of wavelengths than has been contemplated, and there may be technical difficulties in designing a single standard set of simple construction and operation, to cover this comparatively large waveband. If it is found that one standard set, or a standard set fitted with waveband change arrangements, will not meet the case, we should have to have two types of different wavelength ranges. This would be an inconvenience and expense as units would have to have both types, or else complications would occur in the allotment of wavelengths when formations change their relative positions. In view of technical development, however, the provision of a set to cover the whole of the waveband required, does not appear to be too much to ask for.

4. *Type of artillery sets required.*

In the previous article it was considered that for field artillery a range of 8000 yards would be sufficient. For medium artillery a range of 14,000 yards was considered necessary. It was suggested that it might be possible to produce one universal artillery set capable of dealing with the longest ranges. This would be possible, but it would mean sacrificing a certain amount of portability in the sets required for field artillery. To get the additional range, a more powerful transmitter would be required. This means more weight, particularly if an accumulator is to be the source of power for small portable sets for use in the field. The drain on this accessory, even with the smallest sets, may prove comparable to, though less in degree than that on the starting battery of a motor car. A large and heavy accumulator is a necessity for satisfactory working. There need be little difference in the size and weight

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of the receiver. The writer is rather attracted to the idea of having two types of artillery transmitter and one type of receiver which can be used with either type of transmitter or alone as a listening set.

Medium artillery units could be equipped with the more powerful transmitter so that their distance could be adequately covered. Field artillery would have both types. The larger transmitters could be used in field battery positions, and brigade headquarters, while the smaller and more portable sets could be used at O.P's and in the more exposed areas. These sets in battery positions and brigade H.Q's would not be working at their maximum output, otherwise interference might be caused to other divisions some distance away as was mentioned before. There would be a reserve of power, however, which might be useful on occasions. A point that must not be lost sight of in this question of portability is the possibility of the transmitter getting its power direct from the electrical equipment of any mechanised battery staff vehicle, which might be provided in the future. As already mentioned, the accumulator is the heavy item and if it is only to be used as a reserve, when current from a mechanised vehicle is not available, it need not be so big.

It might be well here to touch on the question of "one-way" as opposed to "two-way" or "duplex" telephony. On first aquaintance with a simple wireless telephone set the most noticeable feature is that it is impossible to speak and hear at the same time. When speaking it is necessary to give the caution "over" and to alter a switch before an answer can be obtained. At first it seems a very awkward procedure and a distinct handicap. After a short time, however, changing "over" becomes quite automatic and any conversation can be carried out without difficulty but, of course, it takes a little longer than with the ordinary two-way telephone. No simple method of duplex working has yet been evolved which would be suitable for small portable sets used under the conditions which we are discussing. Switching over to telegraphy from telephony, and vice versa, presents no difficulty either in design or operation.

The provision of a form of what is known as "remote control" does not add materially to the weight of the set. It is essential for artillery purposes as it enables an observing officer to get two or

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three hundred yards from the actual set and still be in telephonic communication with his battery.

As regards the shape and layout of the various components which comprise the set, these can be made, within limits, to practically any specification to suit the particular form or forms of transport adopted. Even if the sets are to be carried normally on a vehicle of some kind, it would be wise to insist that it should be capable of being broken up into loads of a convenient shape and weight to be carried on the man.

5. *Allotment and control of artillery wavelengths.*

When the time comes this question will be of great importance in framing the artillery plan for every operation. The allotment of wavelengths will have to be carefully considered and included in nearly all artillery operation orders. It is proposed therefore to touch on the question in order to show the type of problem which is to be expected.

Since all wireless sets in our present army organisation are operated by the Royal Corps of Signals the allotment of wavelengths is their responsibility. It is obvious that this control must be centralised to the greatest possible extent, so as to avoid an "ether traffic jam," and make full use of the sets available. When the artillery have an exclusive waveband of their own, the allotment within this band must be an artillery responsibility as it will depend entirely on the artillery tactical situation.

We have assumed that a divisional artillery may expect to have 13 or 14 clear wavelengths for its own use. The C.R.A. will sub-allot wavelengths to brigades in accordance with the requirements of the situation. In mobile operations where frontages are wide, and the number of brigades forward few, it might be possible to give each brigade as many as five wavelengths. In more deliberate operations—with more artillery deployed—the number of wavelengths for each brigade will have to be reduced. The number to be given to any particular brigade will depend on its role in the battle and the use to which its wireless can be put. It will then have to be settled which particular wavelengths are to be allotted to each brigade. In deciding this point, the principle is that sets which are likely to be near to each other on the ground should be

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separated from each other in wavelength as far as possible. It follows then that a brigade to which, say, five wavelengths are allotted, should not be given five adjacent wavelengths but should be given wavelengths which are separated by those allotted to another brigade. In this way a brigade will be able to distribute its sets on the ground without fear of mutual interference. The fact that this is necessary appears to conflict with what has been said previously about selectivity in the specification of our equipment.

The reason is best illustrated by an example. Two sets, A and B, which are situated 1000 yards apart and working on different wavelengths may be able to carry on communication with two distant stations C and D respectively without a trace of mutual interference. If, however, A and B are placed near together, say within 200 yards, as might be the case of two O.P. sets working with different batteries of a brigade, there is a much greater risk of the signals from the transmitter of one set filtering into the receiver of the other, and so drowning all other signals, when the wavelength difference between A and B is small. This "flooding effect" can of course be reduced by increasing the selectivity and screening of the sets, provided there is room left for improvement in these directions. Incidentally it may be mentioned here that one of the advantages of the fitting of remote control is that it enables two observing officers to be together while their sets are some two to four hundred yards apart so as to reduce the possibility of mutual interference.

A further difficulty which affects the whole question is that of calibration. There is a wave meter on every set by which it is adjusted to transmit on the require wavelength. These instruments are subject to slight errors, consequently two stations ordered to operate on adjacent wavelengths may be interfering with each other owing to faulty calibration of their wave meters. This interference is likely to be more acute if the stations are relatively near to each other, as in the case of two sets in the same brigade.

It will be seen that it is necessary to consider the allotment of "wavelengths" instead of "sets." Each artillery unit should have its sets with its own unit operators; but permission to use the sets for transmitting purposes will depend on the allotment of wavelengths. It is for the artillery commander to decide how best to

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utilise his radio resources and to allot wavelengths accordingly, taking it as a principle that stations near to each other on the ground are separated as far as possible in wavelengths.

6. *Conclusion.*

In the previous article it was stated that "a distinct duty nevertheless rests with the artilleryman to arrive at some conclusion as to the general system of radio telephony communications necessary under varying tactical considerations, so that experts may be provided with some specifications to work to." An attempt has been made in the present article to explain in non-technical language some of the characteristics of wireless which have a direct bearing on this problem. The expert wants to know what is needed before he can begin designing. In the case of artillery equipment he is always given such requirements as range, size of shell, weight behind team, and handiness in action, etc. So it must be in the case of wireless equipment. He must be given a reasonable specification to work on. If this is done, it is not unreasonable to assume that the Regiment will in time be provided with wireless equipment that will go far to solve the main artillery problem of the day.

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WEAPONS.

The Interdependence of Policy, Strategy, and Tactics, with their Design, Finance, and Provision.

By Captain C. T. Beckett, M.C., R.A.

PART I.

THE logic, the procedure, and more particularly the limitations, which govern weapon production to-day are amongst the most vital of the problems which require clear appreciation if the nation is to be organised for a war, however remote, on a national scale. With an Army such as ours it is possible to experiment on a convenient scale with our theories but while on the one hand the Empire affords a wide field for the appreciation of the many material and climatic factors, on the other, the very efficiency of the regular army is a handicap in the appreciation of the difficulties which will face those in whose hands the training of a citizen army will lie should the occasion for a national effort in the field come again. The more, therefore, the subject of this short and inadequate survey, the weapon, is discussed and ventilated the more will it be possible for the nation to rely upon its professional army to do the work for which it has been trained, supported to the full by engineering and chemical science, and to produce by the efforts of the general population of the country in the pursuance of the professions which have been their life occupation, the tools for that army to use so that the toll on its manhood will be curtailed.

Marshal Foch has said that the nation whose productive capacity is best organised will be the victor of the future, and if it can be brought home that the organisation of industrial preparedness and of industrial victory are attained by precisely the same processes as victory in the field—long reflection, laborious appreciation, careful and meticulous organisation, reasoned selection of the decisive factor, and the concentration of reserves for its successful accomplishment to the exclusion of other desirable but less essential

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services, flashes of genius to mislead, overtake or overwhelm the adversary—then it may be that war will not again be a matter of attrition, and that the genius of the Commander may find scope for the attainment of victory in the field. Sir Edward Creasy in his preface to his *Fifteen Decisive Battles of the World* makes some play with his theories of the position of minor events, the detail of the historical picture, in the general trend of human affairs.

The historian of world events can perhaps afford to ignore the minutiæ of history. Artists such as Turner or Constable did not set out on their canvas the meticulous detail of a Van Eyk, a Franz Hals, or a Cosway, nor did a composer such as Wagner seek the detailed effects achieved by Puccini or Strauss.

Nevertheless, a true appreciation of the importance of detail must always be present, relative to the magnitude of the task in hand, and in the production of *materiel* its importance stands higher than in other spheres of philosophic thought. It is not irrelevant to recall that defective masts prevented the fleet from relieving Cornwallis at Yorktown and perhaps thereby lost to us the American Colonies, and that a defective coach wheel delayed the fugitive Louis XVI at Varennes, whence his return in the hands of the mob turned Europe into an armed camp for a quarter of a century, unleashed Napoleon, and opened the door to democracy.

What then, are the objectives of weapon design and production?

Firstly the destruction of the enemy forces in the field by the correct and successful employment of weapons. To attain this objective there are five subsidiary and immediate objectives—the mobility of the soldier, the fire power of the soldier, the protection of the soldier, the hygiene of the soldier, in short the tactical efficiency of the soldier, and last but not least, simplicity of manufacture. However much it may be argued that policy and strategy affect and govern design to the exclusion in the first instance of all other factors, the interplay of design and tactics is so intimate that after the first reaction of tactics to invention, it is difficult to disentangle their respective reactions one from another, but ultimately the characteristics of the weapon must govern the tactics of its use.

The historical aspect of any discussion is of considerable importance. The lessons of analogy or contrast, of faults of

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omission or commission, afford a basis or argument upon which may be based the action of to-day and to-morrow. In the field of weapon design it is unfortunate that the riot of progress has been confined to the last seventy-five years and that the preceding centuries should afford so little of interest from a productive point of view; yet the interplay of tactical principles with design is most marked during the classical and middle ages as can be seen from a review of warfare from the days of the Roman Republic. It is not possible in this article to elaborate further the lessons of the past, but it will be sufficient if modern practice, the doctrine of balance as applied to mobility, security, fire power, economy and simplicity is contrasted with those periods when mobility or security, to their mutual destruction, strove for supremacy. In our time the increase of fire-power, which modern manufacturing technique has made compatible with mobility, has placed the design of warlike material upon a more level basis which permits greater equality of consideration being paid to the principles of war. Fire power often stands deputy for security. Fire power itself is but another form of mobility, the mobility of the projectile as contrasted with the more easily understood mobility of the projector, and security as expressed in mobility rather than in immobile protection is too well understood to need further discussion.

The marriage of fire power and mobility to-day is largely a matter of convenience and no better example can be found than in comparing the attributes and performance of such weapons differing widely in performance, as the ·8″ Oerlikon machine gun, the 3″ mortar, the 18 pr. and the 9·2″ howitzer. Each of these weapons in a similar period can deliver, from its normal position of tactical employment, approximately the same weight of high explosive and metal to a reasonable distance within the enemy's territory, with an approximately equal degree of accuracy, yet the difference in the degree of mobility of each of these projectors, in the convenience of handling, in the convenience of tactical command, in the mobility of the projectile, in the possibility of concentration or distribution of the fire power and in the facilities for service, is most marked. Each of these weapons in fact differs in essentials for the task for which it has been designed only in

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the convenience of its supply in the field and in its technical manufacture. The sum of the fire power of each is identical. It is to the technique of industry that the soldier to-day owes the flexibility of fire power and his comfort in war. Breech loading, wire wound guns, air recuperators, high grade steel, even-burning propellants, highly developed explosives, all date their existence from the dawn of the industrial age notwithstanding that their creation had been conceived as long ago as the sixteenth century. Fire power itself shows signs of a pause in its development. Economy of supply has called a halt. Development for a while will lie in the direction of improved technique of manufacture, in reduced cost, and in improved mobility of the weapon. Such enhanced power as it may gather will be gained by auxiliaries such as improved communications both signal and vehicular, by more precise methods of fire control such as are afforded by sound ranging, by survey processes, and by chemical fillings.

A leading engineer of the early nineteenth century, Henry Robinson Palmer, defined the engineer as the medium between the scientist and the manufacturer. It is clear that to appreciate the factors of weapon production, to create an organisation to control the producers, and to produce the weapons in sufficient quantity, of adequate quality and correct type, some intermediary between the general military body and the general civilian manufacturing body is necessary. A body of military consultants is essential. Their duties call for more stress being laid on their military experience than on their technical qualifications as in this respect they can seek the assistance of their many specialist advisers. Their general and technical education must be such as will enable them to appreciate a problem of munition supply with due regard to all the military, economic, manufacturing and scientific factors. Inasmuch as the problem of weapon production only assumed economic importance with the rise of fire power it was natural that control of weapon production grew up in the hands of the Master-General of the Ordnance and it is significant that the term engineer in its earliest and narrowest meaning was confined to those who designed and operated military engines, the forerunners of the gun.

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The history of the office of Master-General is a very true picture of the progress of weapon production. In its earlier years, from the 14th to the end of the 16th century, its functions were real and its duties were live duties. With the stagnation of progress in weapon design which coincided with the absence of political morality in the seventeenth century the office became a profitable sinecure. Later the office became a convenient method of rewarding great commanders, such as Marlborough, with a source of profit. In later days, from 1750 to the temporary extinction of the office in 1855, it was a convenient means of including in the Cabinet in a political capacity some soldier of distinction, such as Cornwallis, to bolster up the Secretary for War and to act in some respects as a Chief of the General Staff. His powers of expression and responsibility to the Crown or to Parliament varied with the current condition of political philisophy. With the extinction of the office in 1855 a period of restless change and inefficiency in the organisation for the production of *materiel* set in, during which ministerial control alternated with military control and contact with civilian thought was negligible. There followed a short period of civilian control to the detriment of military requirements, until in 1899 the soldiers, military engineers in the true traditional sense of the word, operators of military engines and the link between the soldier and the manufacturer, took charge.

In 1904 the Esher Committee reconstituted the office of Master-General in the Army Council but burdened its organisation with the recreation of an ill-defined and misunderstood link with the Royal Artillery and Royal Engineers, thus limiting the scope of its horizon with the atrophied functions of a long defunct tradition of patronage. This misconception of tradition with which the Esher Committee had shackled the respective duties of the Master-General and Quarter-Master General was finally cleared away in 1928 when the second great principle of war organisation, Unity of Effort was hallowed by representation of the Master-General in the field, and by the concentration in his hands of all responsibility for research, design, manufacture, supply, storage and distribution, inspection and repair of all warlike stores.

It is unnecessary here to labour at length the intimate connection between the respective stages in the life of a warlike store.

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One example will for the moment suffice. Let us suppose that for reasons of simplicity of manufacture, uniformity of pattern, and supply of raw material, it has been decided to employ as the propellant for a field howitzer one approved for the navy. Such a change in propellant brings many factors in its train. Its erosive effects on the bore may be considerably greater than the propellants now in favour and the life of the piece proportionately less. A consequent increase in the war reserve of pieces becomes theoretically necessary whereby storage room required for other purposes may be absorbed. Increased inspection and repair are consequential and the earlier extinction of the life of the piece will make correspondingly earlier and larger provision of new weapons in time of war probable. The replacement of the weapon in time of war by a new pattern at once takes shape as a possibility for consideration. It is as unnecessary to labour the advantage, in such a case, of one individual being responsible for the correct appreciation of the factors of production which made the original change of propellant desirable as it is to labour the advantage of the same individual being able to appreciate the relative importance of the factors of storage, distribution, inspection and repair, provision of reserves, and possible replacement by a different weapon altogether when the type, by then possibly obsolescent, has completed its life on a wholesale scale. That these factors, for effective appreciation, involve control both in the storage depots at home and in the field by the same responsible officer requires no elaboration.

There remains the question of High Policy. Vice-Admiral Sir Herbert Richmond in his "National Policy and Naval Strength" develops very clearly the alternatives of policy which lie before the government of this country. Shall the grand strategy of Great Britain be maritime or continental? It is convenient to turn to the navy for examples of the cleavage in design and production, on this broad issue. The Great War found us with a navy and an army equipped for the fulfilment of a maritime policy despite ill-defined continental tendencies. The more limited implications of a continental policy gave to the German Navy in big ship design, an advantage at Jutland but lost her the battle of the Falklands, and with it the power of commerce destruction by surface ships.

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On land our guns and carriages were designed for such wars as a maritime policy brings in its train and our ammunition design and scale of provision were on a similar scale. To-day, the Locarno Treaty apart, our policy is again pacifically maritime with a continental directive away from Europe and to compare our problems of design and provision with those of a power whose policy is so exclusively continental as France, obsessed with her northern and eastern land frontiers, is ridiculous. To the details of such a contrast further reference will be made in due course. The policy clear, the General Staff can outline their general views on the type of operations and their typical requirements in *materiel.* The Master-General and his staff of military consultants with their specialists and expert advisers examine and interpret these typical requirements and prepare for production accordingly.

The necessity for a clear cut policy in the mind of government, and for a clear cut appreciation of such a policy by the General Staff, can be best exemplified by the difficulties which beset The White Knight in his journey through the wood in Lewis Carrol's "Alice through the Looking Glass." The imagination instinctively turns from contemplation of Tenniel's overburdened phantom to many a similar sovereign remedy propounded for many a warlike situation. "But why are there anklets round his feet" asked Alice. "To keep away the bites of sharks," the Knight replied.

A confusion between continental and maritime warfare such as this is bad enough, but confusion becomes worse confounded when a weapon is proposed to fulfil roles often differing considerably in technical execution and not infrequently diametrically opposed tactically. Of such are weapons designed for both anti-tank work and close support in the attack and weapons that combine a perfection of anti-aircraft defence with the highest demand for effective offensive ground action. The one man band is seldom as satisfactory a performer as the orchestra of normal composition. It is an expensive example of cacophonous inharmony admirable solely for the gymnastic ability which inadequately controls it.

What then are the factors of Design? The factors of design are those factors which are the principles of success in every undertaking, and which, with a somewhat exclusive magniloquence, are described in Field Service Regulations as the Principles of War

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Organisation and the Principles of War. The objectives of design have been outlined earlier in this paper. In every weapon or warlike store the designer must be informed first and foremost of the primary objective in mind and he must be informed if the purpose of the weapon is primarily offensive or defensive. So equipped the Master-General's staff can consider each factor in turn and give them due weight in an harmonious whole. Since the purpose of any such project is the construction of an object in metal or some other material whose use and form once created must be limited by the instructions which governed its designer, it is not illogical to place first and foremost amongst these principles and factors—

Maintenance of the Objective.

Is this objective offensive or defensive; are the demands which the weapon or vehicle is to satisfy simple or multiple, complementary or antagonistic? A vehicle which is primarily designed as a vehicle of general utility will fall short of the ideal to a considerable degree if also used for highly specialised duties, such as those connected with the tactical employment of the battery staff. What degree of efficiency then is required in the performance of multiple demands and what is the primary objective? Compromise is seldom attainable except at the expense of efficiency. Compromise can only be justified on the score of economy or convenience. The question of bastard or composite weapons has already been touched upon. The museums of the past and the armouries of eastern potentates are littered with dead and gone examples of their futility. The chair beloved of the oriental which plays a tune on a concealed musical box when the occupant seats himself is neither a reposeful chair nor a satisfying musical instrument. Let it be admitted then that maintenance of the objective is first in importance.

Mobility.

Next in importance indisputably must be mobility. What type of mobility is required, mobility of the weapon or mobility of the projectile? Here again maintenance of the objective is of prime importance. A weapon designed principally for individual mobility

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will sacrifice of necessity certain essentials which accompany mobility of the projectile, such as weight in recoil strength, safety factor, traverse and range. Little good can come of post-design alterations of a fundamental nature. The 18 pr. Mark IV platform, if added to the gun, may bid fair to equal in weight and so in mobility the 18 pr. Mark V whose surplus of weight over the 18 pr. Mark IV it was designed to circumvent. Some compromise with mobility is not only essential but is inevitable for economy and for convenience, and to suit the weapon for the special task for which it is required. The compromise in the case of weapons is one between mobility and fire power and can only be achieved by a full knowledge and discussion of the tactical purpose and supply organisation which the General Staff have in mind when formulating their demands. That the problem is simplified if these demands are kept within the 50% zone of possible means of employment requires little elaboration. The imperial problem however seldom permits of such clear cut propositions and the third and next factor, that of economy, consequently suffers.

Economy.

The factor of economy is not merely financial, though in all its ultimate issues save two, those of maintenance and replacement, it is generally contributory to financial economy. Economy is possible firstly in the case of civil resources and material. This is seldom possible in the case of weapon production though much can be done in the way of conforming to civil practice in components such as nuts, bolts, greasers, piping and steel components generally. There are such examples, however, and the Stokes mortar cartridge is the sporting cartridge in all essentials and is taken from civil resources. In the case of vehicle chassis, both mechanical and horse drawn, such economy is not only possible but is essential.

Economy in weight is often a boomerang in its effect. Loss of weight is only too often loss of strength and loss of strength means increased maintenance and earlier recurrent replacement charges. These must be balanced against economies in traction costs and in the economy of numbers which increased mobility affords. Economy in power is not always possible if economy in production and in pattern is desirable. For ease of production

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economy in pattern is of primary importance and it will often be necessary to design a weapon whose means of applying fire power is adequate to cover two or even three tactical uses. Of such would be a light howitzer, introduced in preference to three different types of weapon of varying types of fire power for such purposes as close support of infantry, mountain warfare, and cavalry accompaniment. Again, it may be convenient to produce one type of tractor which will carry or draw a group of weapons rather than to design for each weapon a tractor of appropriately limited power.

Economy in personnel is a factor of the greatest significance. A calibrating sight for high velocity guns in replacement of the independent line of sight may conceivably be somewhat less rapid in operation and may slow up by a round or two the expenditure of ammunition, possibly ill aimed, during a "mad minute." If three such occasions are forced upon a battery in a war of five years duration the slight loss of fire power is but a small price to pay for the elimination from each detachment of a gun number and the consequent economy in life and money which such a reduction in effectives would entail. It is an unfortunate feature of our national system of finance that economy in first cost is forced into a position of importance and it requires considerable public spirit, and a very real appreciation of the user view and of after-care difficulties, to bring into the picture the really important aspects of economy in inspection, maintenance and accommodation costs.

The national system of treasury control and parliamentary responsibility, coupled with annual estimates and the "Vote" system, restrict policy to expenditure from income only in peace. A large business determined to carry out a wide scheme of reorganisation and re-equipment would choose a time when its business was least likely to be affected, would offer an issue of debentures to obtain the necessary capital and would if necessary, reorganise its existing capital commitments to permit of a smooth change over and a subsequent recovery. Such a reorganisation spread over several years paid for out of income would hardly be complete before it was out of date.

Nevertheless the nation restricts the services to reorganisation and re-equipment from income during the period most favourable to such operations, times of peace, leaving bulk re-equipment to be

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met from a war budget provided from national capital. It may be agreed that the political effect upon the world if first-class powers were in the habit of raising loans from time to time to re-equip or reorganise their fighting forces would be disastrous. That the existing system is inevitable is no answer to the general question of national economy. Nevertheless, such a system must handicap schemes of reorganisation, leaving their fulfilment to the less favourable opportunity afforded by war, and must in the cause of immediate economy, press the claims of economy in first cost to the detriment of economy in recurrent charges.

Security.

Next in convenience if by reason only of its effect on economy, if not by reason of its importance, comes the factor of security. The nature of security aimed at must first be determined, and then the degree which is essential for that purpose. Is the weapon to provide principally for the security of the force by reason of its tactical role, and is the force to provide for the security of the weapon, or is a high degree of individual security, due to the hazardous nature of its employment, desirable in the weapon itself? If the latter, sacrifice in mobility, in fire power and in money must be faced. Security is attained not only by defensive armour; it can be attained by versatility of performance. Both aspects mean weight, and weight is expensive, apart from the cost of armour and the complications which versatility requires of any machine. The introduction of a high factor of security is the greatest threat to the maintenance of the objective which the producer may be called upon to face. The achievement of security by mobility, by fire power, by due regard for simplicity, by the logical allocation of similar tasks to weapons rather than by imposing upon them demands for versatility in unlike requirements, is more productive of genuine economy than any other method which the satire of a Lewis Carrol can portray.

Co-operation.

The co-operation of various classes of *materiel* is an easy matter once maintenance of the objective is established. The logical increase of shell power from the smallest weapon to the

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largest presents no difficulties if the tactical picture is a clear one. The design of weapons to project such projectiles is a more difficult step but the organisation of fire power in terms of dispersion, range, weight and disruptive effect, and of tractive power in terms of speciality, mobility or capacity is comparatively simple. There are points of contact where overlap is not only difficult to avoid but where indeed it would appear essential. For example, the point at which the scale of projectiles ceases to be primarily man-killing and merges into a scale of disruptives, is debatable ground where controversy and tactical uncertainty can only be stifled by compromise, while the co-operative requirements of chemical, smoke and high explosive fillings, at variance with one another and with simplicity of manufacture, seem to defy equitable satisfaction.

Surprise.

Surprise may be fundamental. It may be based upon industrial organisation and readiness for industrial mobilisation. France has openly begun to organise the nation on a basis of production and Germany is credited with plans for the removal of her industrial centres to less vulnerable localities than her western frontier. The United States have an intricate and highly organised system of industrial preparedness to maintain. Great Britain has not been idle.

Fundamental surprise may also be procured by the production at some psychological moment of some new weapon, or some vast stride in the employment of some well-understood weapon. Examples of the former may be found in Hannibal's employment of elephants, in the invention of the mitrailleuse, in the employment of gas at Ypres in 1915, and in the production of the tank in 1916. The rapid advance of the German heavy artillery to the siege of Liège, and the bombardment of Paris by super long-range artillery are examples of the latter category.

Surprise may be technical. The search for flashless and noiseless propellants is of this category. It may be economic. The search for substitutes for cotton for cordite manufacture is of this nature. Germany provided innumerable examples of *Ersatz* surprises in the Great War. It may be local. Instantaneous fuzes

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and high velocity guns produce this element of surprise. It may be accessory to tactical surprise as when provided by the agency of survey instruments, of sound locators or of smoke shell. Surprise, dependent as it is upon the inadequate security arrangements of peace, is the least dependable of the weapons which line the belt of the producer.

There remain three factors which link the everyday factors of success to the factor of production which will be dealt with in a later paper. These are firstly the factor of safety, secondly the user factor, and thirdly the geographical and climatic factor.

The Factor of Safety.

The factor of safety is the trap into which most critics of British weapon design fall. Continental practice in consonance with continental public opinion and the prevalence of conscription is far behind Great Britain in this respect. We do not accept with equanimity any degree of safety less than absolute for our weapons and for our projectiles. British engineering practice as a whole supports this attitude, often to its disadvantage in competition with foreign engineering contractors. In the Services the voluntary system depends to a large extent on the absolute confidence of the man in the safety of his weapon. Parliamentary government and the ministerial machine could not accept for one moment any doctrine of safety which weighed men's lives in the balance, when voluntarily offered for service, against the expenditure of a few pounds or pence. Under a system of conscription the feeling may well be more lenient. The light element of danger is a part of every man's equal burden in the service of the state. It is not, however, the English practice to expect the voluntarily engaged servant, be he of the state or of the individual, to run risks which money can obviate. The English reputation for thoroughness is responsible for the factor of safety which we employ. It has only to be said that foreign enquiries have been made as to how it is that British artillery, unlike foreign artillery, is able to fire high explosive shell save "under precautions," to realise that such a high factor has its points. Nevertheless, the increase in weight, the loss of mobility, the extra financial expenditure, the additional requirements in raw material, the added difficulties of fuze design and

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ammunition manufacture all are a serious "first cost" in our productive programme which only reduced maintenance and inspection charges can partially balance.

The User Factor.

Our weapons are designed, unlike continental practice, for a polyglot imperial population. The Haussa, the Pathan, the Punjabi, the Iraqi, the Sudanese, the Malayan, all may be required to use a weapon which the Gaelic speaking Highlander, the Canadian, Australian or ordinary Englishman of varying educational ability customarily handles. Even the humble mess cart may produce in its method of draught a complication which will gall the grass-fed animals called up for annual training in Australia. And so for uniformity's sake within the empire and lest mobilisation should bring forward soft horses in large numbers, some thousands of pounds in the Dominions and in Great Britain are spent to remove the evil. Language and education differing widely in every Dominion accentuate the importance of the user factor of which the keynote is simplicity. The necessity for a uniform system of training laid down by an Imperial General Staff is vitally apparent in the problems of production if an Imperial Army is to be a practical possibility. To these major considerations of the user must be added two others. The physiological aspect, too often neglected, which should cater for his comfort and convenience when handling his weapon, and the psychological factor in which the factor of safety and the factor of security combine to produce confidence in the efficacy of the weapon and in the personal safety of the user which foolproof fuzes and gun shields do so much to support.

Geographical and Climatic Factors.

The geographical and climatic factors are an almost exclusive peculiarity of British production. In the main they need no elaboration but such aspects as the need for dust excluders on the air intakes of petrol engines and for similar precautions on axles and bearings of all vehicles are by no means so obvious in their relation to the availability of civil resources where the limited radius of employment of such vehicles does not demand such

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delicate attentions. In such a matter as the design of an oil-burning petrol-driven cooking vehicle the geographical location of British responsibilities has weight in the choice of fuel to replace coal and wood which may not be conveniently available, whose transport is expensive and when sea-borne in time of war is hazardous and extravagant of tonnage. The roadless and railless condition of much of our empire and its effect upon transport and carriage design needs little further remark than to contrast it with the probable highly developed theatres of war of continental powers. In matters of ammunition design, however, the climatic factor is most evident. Propellants designed to withstand storage both at Quebec and Singapore must be the subject of diligent research and constant inspection coupled with narrow tolerances of manufacturing process. Fuzes and shell with sensitive detonating compositions and explosives require the most intimate and careful design if damp is not to enter their interiors to their detriment.

Few of these limitations exist in the same degree to hamper our more self-contained continental neighbours. Comparison of British munition production with the efforts of continental firms is therefore seldom illuminating, generally illusory and can only discourage what is essentially a "high class" trade. The high quality of British munition production is forced upon the armament trade by imperial requirements whatever the markets of the world may require of a shoddier nature. No one, however ignorant, demands that the Sheffield cutlery trade shall sink to the standard of the Belgian producer to capture the cheap cutlery market.

It were well if those who persistently recommend that those responsible for munition production in Great Britain should follow continental example and descend to a lower standard of excellence, should first consider whether in reality the continental manufacturer would not gladly follow Great Britain if he could get the money, whether the conditions are in any way analogous, and whether such criticism, openly expressed, does anything except to turn munition orders away from this country into the more complaisant bureaux of foreign armament manufacturers to the great advantage of the Swedish heavy industries and of French military prestige.

(To be continued.)

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THE TRANSJORDAN FRONTIER FORCE.

By Captain L. K. Lockhart, M.B.E., M.C., R.A.

AN outstanding topic of discussion—the promotion block—much debated in the mess at the time of my return from service with the Transjordan Frontier Force, has prompted me to put down in as concise a manner as an inexperienced pen permits, the details of service and other points of interest concerning an Imperial Force little known to those officers suffering from the present slow rate of promotion in the Royal Artillery. The vagueness of most people as to the precise location of Transjordan is so widespread that a short description of the country will help to fix our bearings.

As a glance at the map will show, Zarqa, the headquarters of the Transjordan Frontier Force is situated on the Hedjaz Railway about 20 km. north of Amman, the capital of the country and the seat of H.H. The Emir Abdullah who was appointed Hon. Colonel of the Force in the autumn of 1927, and of the British resident, Colonel C. H. F. Cox, who, by the way, is a retired gunner. The country is landlocked except at one small section of its frontiers, where stands the port of Aqaba at the head of the gulf flanking the south-east side of the Sinai peninsula. On the west, the Palestine—Transjordan Frontier runs northwards from Aqaba up the Wadi Araba to the Dead Sea then follows the Jordan till its junction with the Yarmuk river. This stream runs roughly east and west, and acts as the northern boundary between Transjordan and Syria. Near the point where the Hedjaz Railway leaves the Yarmuk Gorge, this northern boundary turns in a south-easterly direction and follows a line of cairns across the cultivated plain to Nasib, a station of the Hedjaz Railway south of Deraa Junction (inclusive to Syria). Thence a track, patrolled from time to time by R.A.F. armoured cars, runs across the Mafrak plain and south of the Jebul Druze to join the arbitrary bearing of the northern flank of the desert corridor to Iraq, over which flies the Cairo—Bagdad air mail. The southern flank of this corridor reaches Transjordan at the north end of the Wadi Sirhan near Azraq, thence the Transjordan—Nejd frontier runs slightly west of south

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across the face of the desert to Mudawara, a station on the railway south of Ma'an. From Mudawara a line drawn westward to the gulf of Aqaba forms the southern boundary. The area confined within these boundaries is divided from north to south throughout most of its length by the Hedjaz Railway. In the portion to the east of this railway there is no cultivated ground nor any running water and consequently no settled inhabitants. It is in this strip of the desert that the activities of the Frontier Force are chiefly employed.

Having now fixed the whereabouts of the country, how does one get there? Taking Port Said as the most convenient starting point let us make the journey. After dining comfortably at the Casino Palace, a hired car will take us to Kantara in just over an hour's drive along the west bank of the Suez Canal. From Kantara-West the free ferry lands us on the eastern bank of the canal at the southern terminus of the Palestine Railway. Leaving about 23.30 hours by *wagon-lit*, we arrive at Haifa at 10.00 hours the following morning. If quick travel is necessary and we have chosen a Tuesday, Thursday or Saturday, a train leaving Haifa at 10.15 a.m. will bring us to Zarqa about seven that evening. At Zarqa our journey is ended, as the Frontier Force camp is so near the line that a portion of the Regimental Quartermaster's stores (a few square feet) was built in error on that part of the desert belonging to the Hedjaz Railway, a situation which causes a rental to be paid to the offices of the company in Damascus. Our troubles are over for the moment, too, as most of the Force will be present at the station taking part in that thrice-weekly excitement of seeing who is on the train from Palestine and Syria. Our kit will be taken charge of and before long we shall be swallowing a much needed drink in the mess. The remainder of the evening will prove to be similar to that spent in most messes, so the task of orienting ourselves amidst our immediate surroundings can be left to the morning.

As daylight appears next morning we see immediately to the west the Wadi in which runs the river Zarqa (or the Jabbok which may sound more familiar). Beyond, are the rocky hills which cover the land to Jerash and the Jordan. Northwards lie some miles of small rocky hills—the scene of Lawrence's most successful dynamiting raid—leading up to the Mafraq plain, south-east of the Jebul

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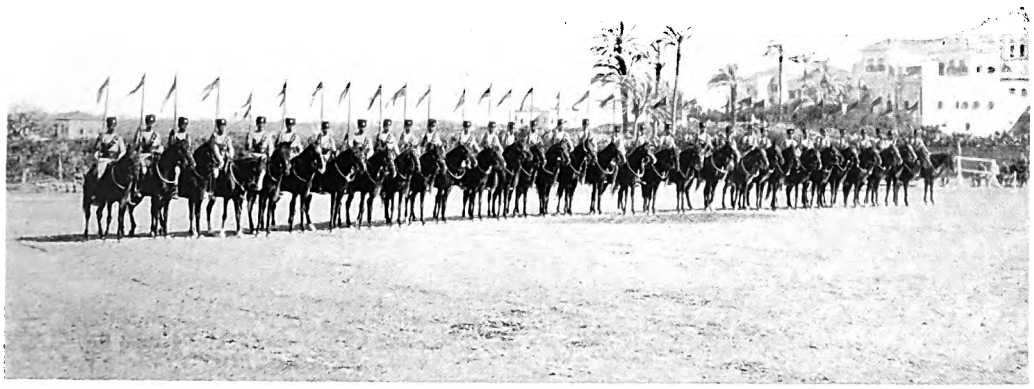

"A" and "B" Companies Musical Ride Detachment.

"C" Company's Tournament Detachment.

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Druze. Eastwards the stony undulating slopes gradually flatten out into 50 miles of waterless desert in the direction of Azraq and the Wadi Sirhan. Southwards are more hills and rocks, but following the Wadi Zarqa is the recently constructed road leading to Amman and from Amman westwards across the Allenby Bridge over the Jordan to Jericho and Jerusalem. This is the only outlet from the country by road for cars excepting a dry-weather track leading to Deraa in Syria and a half-finished road entering Palestine south of the Sea of Galilee. The above description will no doubt give the reader a rather depressing idea of the country in general. In all truth the geographical features of the country and desert near Zarqa are the reverse of pleasing to the eye—and this applies to Ma'an, the southern station of the Force, to an even greater extent.

Now for the Force itself or a little of its history. The Transjordan Frontier Force was formed in April, 1926, and was composed of those N.C.O's and men who were specially selected and who voluntarily enlisted on the disbandment of the Palestine Gendarmerie. As the latter force had existed since 1921, there were consequently N.C.O's and men with up to 5 years' service in units officered by British officers. With this cadre the Transjordan Frontier Force was formed and trained in Palestine. Rapid progress was made and in October, 1926, the Force moved across the Jordan into Transjordan. After wintering under canvas in the Jordan valley the move up to the newly-chosen camping ground at Zarqa was made in April, 1927. In the summer of 1927 the Force was 2½ months in the desert at Azraq conducting operations against the militant members of those Druze refugees who, while based on Azraq in British mandated territory took part in frequent raids and rebel activities across the Syrian borders into the Jebul Druze. The main duties of the Force are: (1) to deal with internal trouble in Transjordan west of the Hedjaz Railway—a situation which in 2½ years has not yet called for action; (2) to operate against enemy raiders or tribes advancing on Transjordan, within the strip of desert 15 miles east of the Hedjaz Railway. In the latter case it is the duty of the R.A.F. to locate the advancing parties and to prevent to the best of their ability—bombs, machine guns and armoured cars are available—their progress towards the

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cultivated areas in organised bodies. The last raid was successfully repelled by the R.A.F. in August, 1924.

There are 17 British officers on the establishment of the Force of whom each of the four companies claims two, a local Major and a local Captain. The Force is self-contained on the administrative side, and has British officers in charge of the pay, medical, veterinary and signal branches. Staff-Sergeants seconded from British regiments are also in charge of the armourer's and farrier's shops and the veterinary staff. As the unit will be of most interest to a prospective candidate for secondment a description of the organisation will not be amiss. The two British officers in each company are assisted by four local officers, each one in command of a troop. These officers may be Arab, Circassian, Turkish, Syrian, Egyptian, Soudanese or Jewish. Most of them understand a little English as all executive orders are given in English though the explanation of them is given in Arabic. Each company's strength is at present about 140, but is liable to further reduction for reasons of economy. The rank and file are mostly Circassians and Arabs, though some Soudanese exist in the Camel Corps and some Jews in the technical detachments—such as soldier clerks, wireless personnel and electrical engineers. The Circassians are recruited from their villages in Palestine and Transjordan. These men are descendants of the Circassian families who were given landed property by the Turks in part payment for their services in policing the country under the Turkish regime. They make keen soldiers and form the backbone of the Force. The Arabs are mostly "fellahin" from the towns and villages of Palestine.

The uniform consists of a khaki drill "kurta" or long-skirted cavalry jacket with shoulder chains, a scarlet kummerband, regulation drill breeches, blue puttees, regulation boots and spurs. The headdress is in summer a "kafiyeh" or Arab headcloth held on to the head by the "agal," a black camel hair rope, and in winter is an astrakan "kalpak" topped with scarlet and braided according to rank. All uniform is made by contract in England under arrangements made by the Crown agents for the Colonies.

The weapon training is of a high standard. Table "R" less the gas mask practice is fired by the trained rifleman and Table "L" less the A.A. practices by the Hotchkiss gunners, and a good pro-

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portion of marksmen are obtained. Great keenness is shown in rifle shooting, and in the Hotchkiss gun at the monthly pool shoots and annual practice. Mounted training is also excellent, both men and horses being well drilled. The Arab ponies perform well over small jumps and at tent-pegging. The animals, both horses and camels are at present the property of the men themselves. All the horses are stallions, though arrangements are maturing for the gelding of new purchases.

On posting to the Force the rank of local captain is granted from date of appointment as company officer. The pay (for a company officer) amounts to £P600 together with £20 kit allowance on joining; plus a "cost of living" allowance of about £50 per annum. A groom and forage for two horses together with a horse allowance of 10/- per month for each horse or camel covers the perquisites except for travelling allowances. Further details can be studied at length in the "Conditions of Service of British Officers in the Transjordan Frontier Force," which can be obtained from the Middle East Department at the Colonial Office. There is at present no income tax in Transjordan. Salaries are paid monthly in arrears in the new Palestine currency which is based on the English values—1000 mils Palestinian equalling £1 sterling or £P1 (lira Palestinian). An officer wishing to extend his contract after serving the initial two years is paid a biennial increment of £50 subject to passing an elementary language test in Arabic—chiefly on military terms—a test which it would be difficult to avoid passing after two years in the country.

The Force uniform (officers' pattern) can be purchased locally at the regimental tailors. Regulation field boots may be worn though black butcher boots are the normal wear. British regimental mess kit may be worn by officers and it is not essential to buy Transjordan Frontier Force mess kit of either summer or winter pattern.

During the last year and a half conditions have materially changed for the better. A good car road joins Zarqa and Amman and three passenger trains weekly now run in place of the occasional weekly one of 1926. A hutment camp together with good stabling from the old 9th Lancer lines at Sarafand has been erected with a power house supplying electric light. Officers' messes, married

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quarters for British and local officers, and canteens have been completed and the present conditions of service have much improved since the pioneer days. At Ma'an a specially sited camp for one company with a newly-bored well has been built of stone and is far superior in construction to any accommodation that has been previously put up for local troops. The single officers accommodation at Zarqa is in huts roofed with corrugated iron and lined with asbestos. A company officer has a single room pannelled throughout with three-ply wood. There are two bathrooms to each block of four quarters. Furniture is usually provided by the individual officer, but a set can be hired from the regimental stores.

The climate is cool in winter and hot in summer. From December to April it frequently freezes at night. The wind occasionally is sand laden, is usually strong and all the more noticeable owing to the lack of cover and the bareness of the countryside. Very little rain falls during the year and at Zarqa is confined to a few days in the winter months. From May to September the sun is hot but the nights are almost invariably cool. It is generally more comfortable to sleep under a sandfly net even if only to defeat the common house fly, rather than owing to the presence of mosquitoes or sandflies themselves. The latter both exist, however, and though the malarial mosquito is rarely met with at Zarqa, owing to the efficient precautions taken to supervise the Zarqa river, it occurs widely throughout the country in localities untouched by anti-malarial work. The day-time heat is dry and in no sense relaxing like the damp, muggy swelter of the Mediterranean coast at such places at Haifa, Jaffa and Beyrout. To avoid the heat, morning parades are carried out from 6 to 8.30 . Office work, dismounted prades, instructional classes and stables during the morning finish the usual daily round.

Polo, mounted sports, games and swimming take place during the late afternoon when the sun begins to quicken its fall to the western horizon. Polo has recently been played by the British officers and the local officers of the Force. As ponies are the private property of the troopers it is easy to arrange to borrow sufficient animals to play twice a week. The officers' chargers, also privately owned, can be played and the cost of playing is limited to the purchase of sticks and a small club subscription. Football and

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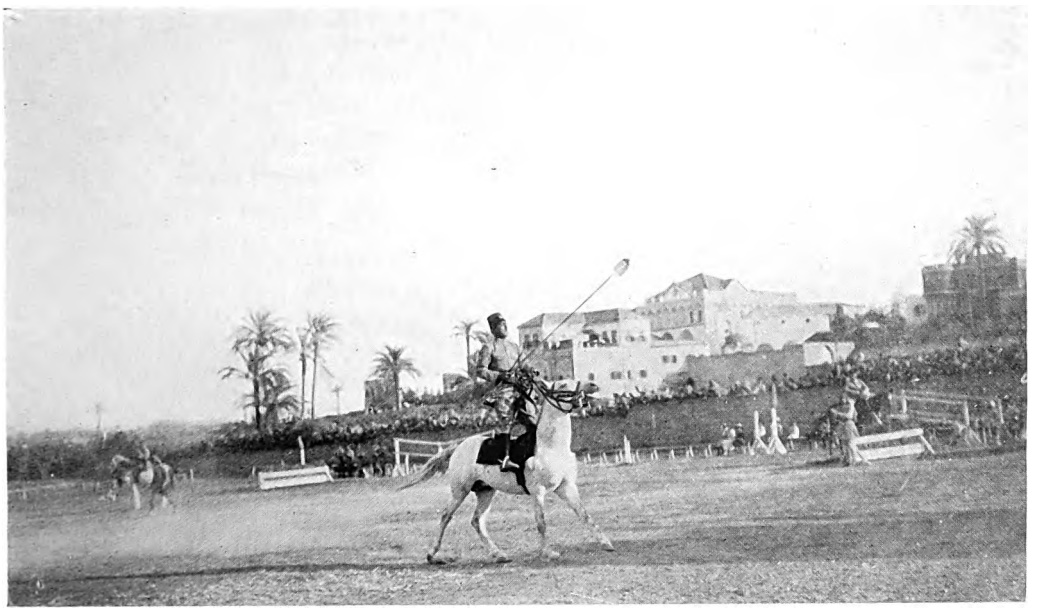

"Taking a peg while Cossack Riding'"

"Two rings and a peg."

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hockey are played in the winter though the rank and file are beginners at these games. A 10 foot fly rod should be taken out by the keen fisherman. There are two sizable varieties of fish in the Zarqa river which runs within a mile of the hill on which the camp is built. One of these two varieties takes a fly well and scales up to 1 lb. in weight with an occasional heavier specimen. Fishing brings us to the river which is in itself a haven of rest to the hot and weary every afternoon throughout the long summer. The delightful strip of well-wooded cultivation on both sides of the stream is laid out with fields and orchards irrigated by swiftly-running channels. Here the apricot, mulberry, pomegranate abound each in turn ripening in the groves along the banks of the excellent bathing pool, some 50 yards long by 30 wide, which is supplied throughout the year with cool water from the rock springs a few hundred yards up the Wadi bed. There is no more attractive spot in the whole of Palestine and Transjordan on a hot summer day.

Small game shooting is varied and a 12-bore is an essential item of equipment; though not in the centre of good shooting country, a short journey takes one within reach of several favourite rendez-vous. Geese, duck, snipe, sandgrouse, seesee, chikoor, the lesser bustard, quail, blue rock pigeon and doves can all be shot in their season, and an occasional gazelle. The desert hare is more common. The rare oryx or straight-horned desert deer which, when viewed sideways gave rise to the unicorn myth exists in the region south of Transjordan. A specimen was recently brought to the camp at Ma'an, but unfortunately did not live in captivity. So huge and ferocious in aspect are the age-old catfish of the desert pools at Azraq oasis that a trooper was once reported to have caught a monster on a nightline composed of headchains ending in a bent picketing peg baited with an unopened tin of bully! As for the size and length of the salamanders—but I had better stop, these tales should be told in the Frontier Force Mess and not in a serious journal.

Six weeks' leave is granted for each year's service and may be accumulated to a total of three months for two years. Local leave is granted up to one month per annum when the exigencies of the service permit. A most enjoyable holiday at quite a small cost

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can be had either in the Lebanon Mountains or in Cyprus. Egypt can also be visited though at far greater cost. Damascus can be reached in the evening by taking the 9 a.m. train from Zarqa station. Once in Syria, car hire is cheap and the road is open to Beyrout, Baalbek, Tripoli, Aleppo and Palmyra—the desert oasis. Palestine and Petra can be visited also but these are only week-end trips.

The country is comparatively—as countries go these days—little known considering it is within seven days of London—or less if one flies. Anyone interested in natural history has a great field for discovery. A casual catch made by an officer at Azrak, when a small green moth was taken to prevent it from singeing itself at a lamp, provided the Natural History Museum at South Kensington with their first specimen of a little-known desert species. During the last two years no less than twenty-four species of butterfly previously unrecorded as occurring in Transjordan have been caught. The Jordan valley itself is a happy hunting ground for the naturalist owing to its unique feature of being from 600 feet below sea level at the Sea of Galilee to nearly 1300 feet below at the Dead Sea. This characteristic produces sub-tropical heat in an otherwise temperate land and is responsible for the presence of a large section of Ethiopian fauna and flora. Palestine and Transjordan are especially rich in bird life and over 350 different species have been reported.

There is also ample scope for anyone interested in archeology and sculpture in Transjordan itself, for besides the amazing rock carvings at Petra, the ruins of Jerash are well worth seeing and have been recently excavated. The fringe of the desert is studded with Crusader castles, Arab hunting fortresses and Roman ruins. In conclusion it can be said that the Frontier Force gives a first-class chance to the junior officer. In no unit could there be more scope for initiative or a better opportunity of obtaining self-confidence and a good power of command in the early days of one's service.

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Façade sur la Cour intérieure du Chateau.

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L'ÉCOLE SUPÉRIEURE DE GUERRE.

BY "COMMENTDONC?"

THESE few lines relating to the above Institution are written from a feeling amounting almost to a sense of duty; for nations from all corners of the globe find it well to send to the Ecole Supérieure de Guerre a selected few of their Staff Officers as students for the two years' course, but the British Empire is an exception. In matters military, study is certainly largely and naturally confined to the great continental type of war and we, with our world-wide interests and the consequently varied types of warfare in which we may find ourselves engaged, probably require a wider scope for our studies. Still, to keep abreast with continental thought, it is certain that a course at l'Ecole Supérieure de Guerre, would be time well spent and never regretted. Before dealing with the syllabus, and in order to give a very general idea of the life there, a few words on the school itself, on the students and instructors and on the organisation are necessary.

The building itself dating back to 1750, is situated in a busy quarter of Paris and serves as a "day school." Instructors and students alike live out and though a luxurious suite of apartments in the centre was allotted to the Commandant, it is actually used as a residence by the Chief of Staff of the Army and Maréchal Joffre has his offices in adjoining quarters. There is a mess in one part of the building for the "Officers of the Garrison of Paris," but it is only used sometimes for meals by some of the few bachelor pupils and is in no way a mess as understood in the British Army. Another portion of the building has been handed over to the "Centre des Hautes Etudes" (an advanced school of strategy for officers of the rank of full colonel and upwards) for class rooms and offices. In other parts will be found a library, which is the only common rendez-vous, where strict silence is observed but which is well frequented between studies; offices for the various instructional staffs, class rooms, stores and married quarters for the school servants. In addition there are in the grounds a Riding Establishment complete with schools, a small gymnasium and a good fencing hall.

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There is an annual entry on an average of 80 French and 30 foreign students, representing about 20 nations, all of whom complete their two years. Each entry is called a "promotion." The Frenchman is accepted to a later age than in this country, there is no restriction in the number admitted from any one arm, and the candidate who presents himself for examination has a rosier chance of being accepted than has the Camberley candidate, for at one recent entrance examination, there were less than 180 candidates for 80 vacancies. Every French student, before he joins has been unofficially "vetted" by several commissions of officers; the entrance examination in many subjects being partly oral and partly written. As regards the foreign student, there is a great disparity in the representatives of the different countries. One country will select an officer or officers who have made their mark in their own army and are fluent French scholars, whilst another will send a representative who cannot read, speak or write French, and who appears to have no particular claim to undergo this interesting course. Sometimes it is a general who is sent by his government, in another case it may be a subaltern. One fact, however, emerges from this cosmopolitan assembly, which is, that the order of merit of the different nations is very well defined. It is universally accepted that the students from such and such a country are invariably the best and that a far lower standard must be expected from candidates from another specified nation. Still, whoever they are, the treatment received by each and all is in the best French spirit of generous hospitality. The Instructors ("Professeurs") are naturally specially selected and it is by no means uncommon to find a senior officer doing a second tour as an Instructor after a certain absence with his regiment. Five years at a spell is not at all an exceptional term for an Instructor and the appointment almost certainly leads to accelerated promotion.

The "Promotions" are each divided into eight "groupes" for work. Each "groupe" has its own class room, and, in addition, each "promotion" is allotted a lecture hall. Further, there are class rooms, common to all, for instruction in languages. Every subject has a separate staff of Instructors, e.g. the Artillery tactics staff does not teach combined tactics, nor does the Infantry tactics staff instruct in Cavalry tactics and so on. So that the School staff consists of a H.Q. staff (Commandant, second in command,

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adjutant, administrative officers) and Instructional staffs in combined tactics, Cavalry, Artillery, Infantry, Fortification, Aviation, Military History, manufacture of war material, riding and four languages. In all 60, of whom about 50 are instructors or nearly one per three French students or per five students of all nationalities. After having successfully passed his entrance examination in the early part of the year, each French student, before joining in November, does a period of attachment to all arms of the service other than his own, and to give an idea of the completeness of this period, every student is expected to be a qualified aerial observer and to hold a car driving licence when he joins.

The School assembles in the first days of November after All Saints Day, and the year is divided into two distinct periods—the indoor and the outdoor. The former finishes about mid-May with two ten-day breaks at Christmas and at Easter, whilst the outdoor period commences on the heels of the indoor and continues to the end of August; but, whilst all work continuously during the indoor half of the year, in the practical or outdoor months, each student gets several recesses depending on the "groupe" to which he belongs. September and October are at the disposal of the students unless they have not completed their period of attachment before joining.

Broadly speaking, during the first year, the tactics of a division are studied and, in his second year, the student passes on to the handling of an army corps. In every case, the formation is "encadré," i.e. supported on both flanks by other troops. The methods of instruction during the indoor period are: (a) Lectures to an entire "promotion"; (b) indoor tactical schemes by one "groupe" at a time, lasting three to four hours and solved *viva voce* under the direction of an instructor; (c) rapid individual written solutions of a tactical problem in class, under the supervision of an instructor and for which about three hours are allowed, and (d) home work, i.e. the written solution of a lengthy problem in every detail (orders, work tables, traffic regulations, barrage tables, etc., etc.) in the students' own time by a given date. (c) and (d) are corrected by an instructor, handed back to the student to see the written comment made on his work, and, finally, examined individually by the instructor with each student in turn. During this period, too, several one-day tactical exercises are carried out

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on the ground in the vicinity of Paris. These indoor months, however, are not limited to the study of tactics. On the contrary, a very wide range of subjects is touched on. For, in addition to the permanent school staffs, a number of gentlemen illustrious in the literary, political, economical, geographical and other worlds are engaged from time to time to give instruction on subjects on which they are perhaps the best qualified in the country to give opinions. This is one of the few advantages of the siting of the school in the metropolis, for, these savants are on the spot. The subjects selected for study are too numerous to enumerate here and cover an exhaustive scale from the high note of Finance to bass discord of Einstein. Yet another method of imparting knowledge during this indoor period is by means of day or half-day visits to establishments of interest, such as Government factories, experimental establishments, a large wireless station, the aeronautical "salon," a naval dockyard, etc., etc. In addition to the above, the students during this period in their *second* year, devote four days to a War Game and the equivalent of four days to an indoor combined naval and military operation scheme in which the staffs and students of both staff colleges participate. All French students are taught typewriting and are expected to be sufficiently proficient to issue secret documents without the help of a clerk. Languages, riding, fencing and physical training figure on alternate days in this part of the syllabus of both years.

As regards the outdoor period, a few words are necessary for each year, as the programme differs for juniors and seniors, except for the fact that all exercises are carried out by two "groupes" at a time in both cases. In his first year the student does three tactical exercises—one on Cavalry tactics, one on Artillery problems, and one on Infantry tactics. The average duration of each is about five days. They are all carried out, mounted on Riding Establishment horses in some district or other about 60. km. from Paris. Staff and students alike are billeted on the inhabitant and billets are changed every third night. Meals are taken at an "estaminet," the terrain changes more often than the billets, there is no relation between these tactical rides though there is a certain continuity of operations as a whole. In these exercises the hours between 6 a.m. and noon are spent on the ground in reconnaissances, making plans, map reading and discussions; orders or a problem, set on the

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morning's work, are produced in the afternoon. In the evening before dinner there is a conference.

In addition to these three exercises, each first-year French student does a three-week tour of the N.E. frontier, studying points of interest and meeting an instructor on pre-arranged dates at given rendez-vous. A diary of this tour is kept by each student. Finally the outdoor period includes a military history tour of about four days on one of the early battlefields of the Great War. As regards practical tactics in the second year, there is one ten-day staff tour for each pair of "groupes." In this case, horse flesh gives way to horse-power and a large convoy of Citroen cars is used. Billeting is run on the same lines as in the first year but a much larger tract of country is used and it is usually considerably further afield. An imaginary army battle is fought in all its phases with detailed study of one of the army corps. The period is usually divided into three phases (e.g. encounter battle, retirement and the resumption of the offensive). Students of the Centre des Hautes Etudes act as commanders of the Army Corps, its Divisions and of the enemy. The students of the Ecole de Guerre perform the duties of staff officers and of subordinate commanders. Every detail of war is studied and the office work is the most trying part. It is a common occurrence for students to be working till 1 and 2 a.m. and to start next day at 7 a.m. Students change functions at each of the three phases, e.g. an individual may find himself chief staff officer of the corps for one phase, C.R.E. of a division for the next and in command of an enemy division for the third. The remainder of the outdoor period is similar in the second year to the first, except that the S.E. frontier is visited and the Military History tour is set on one of the later battlefields of the War. In the course as a whole, work is that of the individual and not of a syndicate. During the whole two years notes are made by all instructors on all work done by each individual and the results are collated at the end. From these results, each "promotion" is divided into three thirds and each third is put in order of seniority. From the order so obtained priority of choice of garrison is given.

Except for the absence of sport, the whole course is excellent, thorough and full of interest. The staff and instructors are as charming as they are competent and the students as good and pleasant a lot as one could wish to meet.

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HOW TO WRITE A DESCRIPTION OF A BATTLE.[1]

By Colonel Grasset.

Translated by Brig.-Genl. W. Evans, C.M.G., D.S.O.

[Translator's Note.—During the last few years Colonel Grasset has published (Berger-Levrault, editor) under the general title "*La Guerre en Action*", a series of remarkable descriptions of battles; in 1923 he brought out *Neufchâteau* (22nd August, 1914); in 1925, *Ethe* and in 1926 *Virton*, the two battles of the 4th French Corps on August 22nd, 1914; in 1927 *Verdun*, the first collision with the 72nd Division on February 21st and 22nd, 1916. At the present time he is publishing in the *Revue Militaire Française*, *Montdidier*, the action of the 42nd Division on August 8th, 1918. Those responsible for producing the Polish military magazine *Bellona* were so much impressed by these accounts that they asked Colonel Grasset to write an article showing the methods he had adopted in writing them. The *Revue Militaire Française* now reproduces this article so that young French officers may have the benefit of his ideas. I translate it in the hope that it may help potential writers in the Regiment. Even if very few serving officers could find the time to go into details as thoroughly as Colonel Grasset this article will help them to form a system and to appreciate the extraordinary difficulty, and the vast amount of work entailed in describing accurately the incidents of a battle in detail.]

. . . . The object of these accounts is to impart strategical and tactical lessons; for these to be of real value the facts must be accurately stated. The combatants must be shown in their right places and the influence of *moral* on the incidents of the fight must be brought out as clearly as that of material.

The difficulties.

It is easy to describe a strategical situation or to discuss higher formations. For this it is only necessary to obtain orders and

[1] Comment mettre sur pied une monographie de combat.—Colonel Grasset.—*Revue Militaire Française*, Nov. 1928.

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reliable reports and to make sure that these were received in time to be acted on. Here you get a good foundation on which to build. A fight, however, is made up of a diversity of events which occur with startling rapidity and react on one another; where men's minds, nerves and bodies are in an abnormal condition. Now it is these events which we wish to treat of, and of the action of the small unit and individual. Any mention of these minor events is very rare in official documents, so that when the broad lines of an engagement are sketched out from official documents these details can only be obtained from those who have been through the mill. Many people doubt the value of such evidence as they consider that no two men see the same event alike. It is this very fact that makes it necessary to question many eye-witnesses to avoid inaccuracy in the details of a fight. If one accepted uncorroborated evidence one might write a very readable account of a battle, but its historical value would be very small and lessons drawn from it even dangerous.

The only originality claimed for the method advocated here lies in the manner adopted for lessening the chances of mistakes, the classification and tabulation of the numerous and often divergent accounts received.

. . . . It requires skill, great skill, coolness and individuality to conduct the action of a regiment, battalion, company, section or even a patrol. Even the most extended course in tactics cannot go into every little detail of a fight. Such factors as the personality of the commander, the fighting value of the troops at the moment, etc., are apt to be missed. It is only by finding out and reconstituting the individual events of a fight that one can show what effect the actualities of battle have on the soldier. These studies are only instructive provided that they are a truthful picture of a fight with all its incidents described as accurately as is humanly possible.

First the man has to be selected to write the account, the material has to be found, and the question of the time it will take considered. To take the writer. Anyone can discuss high strategy. As Marshal Foch puts it—the great events of a war are discussed in the *cafés*. It is a fact that the broad principles of war are simple and anyone can understand them. Napoleon said that the art of

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war was easy, and indeed a lecturer is quite clear to any audience when he says that to beat an army you turn a flank and break the centre if you want an Austerlitz, or envelop both flanks to obtain a Cannae; and if he concludes by saying that these results are nevertheless sometimes difficult to attain, everyone will agree and go home satisfied, their minds full of first principles. This, be it understood, is an exaggerated picture, as of course when someone who knows his subject discourses on a strategic operation, he teaches useful lessons.

It is another matter to try to describe the details of a fight and to be capable of doing so a man must have been through it all himself. He must know what it means to lead a section through the mud and under shrapnel fire, and to be hung up in the enemy's wire. He must understand men, their arms, their methods; have seen them at work under all sorts of conditions and be capable of realising their feelings and their behaviour under fire. This is why it is difficult to find a man capable of writing a good detailed description of a fight. Obviously, too, an infantryman is not the best person to treat of cavalry and artillery fights, similarly airmen or artillerymen are apt to omit details of primary importance if called on to write about the action of a small infantry unit.

This class of work is highly specialised, and can only be done by a writer with the actual fighting knowledge, a good and trained memory, accustomed to organise his ideas, a mind trained to analyse and collate at the same time, the critical sense highly developed, and not apt to let his imagination run away with him. Add to this a knowledge of how to classify and make use of official documents.

Materials. The existence of these is as indispensable as the writer himself. They consist of

(a) official documents;

(b) evidence of men who took part in the fight.

(a) It is necessary to refer to official documents, war diaries, orders and reports to be found at records, to establish the general situation, and to a certain extent the locations of the formations (division, brigade or regiment) of whose action you are going to write. But it need hardly be stated that it does not do to accept all the data they contain. They too must be sorted out, and all have not the same degree of accuracy.

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War diaries vary very much. Some are written a long time after the fighting by officers who were not there. They are compiled rather like a schoolboy does an imposition and are practically valueless. Others written the same evening or the next day, still with the excitement of the battle affecting the writers, are merely of value as being the evidence of combatants, but usually consist of what the adjutant saw himself or heard others say. Finally, those written carefully during the first few days in rest, based on the reports of the combatants may form an excellent guide, requiring only to be supplemented by news of what still smaller units did. It must be confessed that reliable war diaries are exceptional. Usually the war diaries of regiments, brigades, divisions and army corps, though giving a general idea of any important events that have occurred in these formations, seldom contain any details of the action of small units.

Orders, provided they are accurately quoted from, or better still, given in the original text, are of great use, but they too have to be studied and interpreted correctly. Doubtless they state the intentions of the commander at the moment he dictated them, but are cold terse documents and convey no idea of the troubles—tortures perhaps—that may have affected him at the time. So if you rely on these alone for your idea of a battle you will obtain a false impression. Therefore if you wish to be correct, but also to put some life into your account, you must go to the commander and interrogate him. Next it is necessary to ascertain if orders got to those for whom they were intended, and if so whether they were acted on or whether events made their execution impossible—this latter is of very frequent occurrence. You will be astonished to find how great a part the initiative of commanders of small units plays in the conduct of a fight, at any rate in moving warfare. As a rule orders did not reach a company commander in time; so that he usually had to base his action on what the enemy was doing, having regard to the general instructions he had previously received. Thus you see what inaccuracies you may drift into unless you examine carefully the circumstances accompanying an order.

Official reports though of great historical value are also apt to be misleading. These must necessarily be based on those rendered

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by battalion and regimental commanders. Now battalion and regimental commanders are eye-witnesses whose evidence has to be carefully examined. Many reports are innaccurate in fact, to say nothing of those that are "cooked" to conceal some fault, or to emphasize the excellence of some particular unit. Are we then going to discard official reports as a source of information? That would be a pity, but they must be very carefully studied and drastically cut where necessary. To sum up, great care must be exercised if correct information is to be deduced from official documents.

(b) There remains now the inexhaustible mine of individual witnesses. These vary in a thousand ways. There is the truthful man who can describe what he saw; there are others just as willing to be accurate who got the wrong impression of what they did see. To avoid hurting anyone's feelings I shall commence, like the ass in the fable, by acknowledging my own failings in this respect and and I hope readers will pardon me for the following anecdote. In my diary (twenty days of war in epic times) I wrote that on August 22 1914, during the battle of Ethe, about 9 a.m. I left my battalion commander by whose side I was lying down under fire, and went off through a very severe barrage to reconnoitre a position I thought would be of great use later in the fight. This was a hillock on the extreme left of the French line from whence one could overlook the valley of the Ton for a long way in the direction of Virton. I can see the mound to this day with a red brick house on it, a regular tower on which I directed my steps during my dangerous progress. To make myself clear I should explain that I am talking of my impressions as "eye-witness." True I was not my usual self. Shell were passing close overhead; others kept bursting all round me . . . . Machine-gun bullets were cutting furrows in the ground . . . . I was covered with soil, and all the time there was my red house looking at me through the smoke and dust . . . . A deep sunken road came in my way. I jumped down and found myself by a high wall of dry stone. This was my position. . . . .

When he heard my report the battalion commander, himself a "witness," asked me if I was sure I had seen a red house on the hillock . . . . Good Lord! if I was sure. He said no more as

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he knew my love of accuracy, and concluded he had deceived himself. But he was right as it turned out, for when I went to Ethe to study my battle and verify the reports of my "eye-witnesses" on the ground, I went and lay down about where I had lain on that 22 August morning by my battalion commander, and looked towards the mound and I saw, not a red tower but a little yellowish brick sentry box about 4½ feet square, such as gardeners use to put their tools in.

I walked over to the place, now a nursery garden belonging to M. Léger, who assured me that there had never been any other building on this spot—so I am forced to conclude that the red house, which I still see in my mind's eye, never existed at all. You can realise that after that incident I made it an absolute rule never to believe my own evidence unless corroborated by others. And this applies to everyone else's. *Testis unus, testis nullus,* said our forefathers who presumably suffered from the same disabilities as ourselves. You must have at least two evidences of the same fact in agreement before that fact can be accepted.

So far we have discussed witnesses who try to tell the truth about facts they remember or think they remember. There are others who, from having told the story of their battle slightly differently to suit their listeners, finish by altering the whole character of the affair. In the long run such evidence usually has to be discarded, but it also has the disadvantage of putting you on the wrong track and wasting your time. Nowadays, ten years after the war, diaries written from day to day even if they only contain brief entries are preferable to verbal evidence.

The witness who has something to conceal and who therefore wishes to keep out of the limelight is not likely to answer any questions and so you get a gap in your battle front. You must have patience and seek out other people who can tell you and then you may find out that some regrettable incident took place at this particular spot. You may never get reliable information on this point at all, and in this case you must acknowledge your ignorance in editing your brochure.

There is the babbling witness and the witness who is too curt—the enthusiastic and the indifferent; the man who claims all the credit for himself, and the man who is too modest; the man who

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is unwilling to say what he knows for fear of telling it wrong or of getting a comrade into trouble. It can be readily seen that the waste of time and the wrong information gathered in these circumstances are great.

Then you must have witnesses of all ranks. To arrive at the necessary accuracy you must have the detailed evidence of all the generals and higher commanders, most of the staff, at least one officer per company of infantry, machine guns or tanks, per battery of artillery, squadron of cavalry, flight of the air force, and any detachment with a special task. And if two of these witnesses disagree on any point you must get a third to give the casting vote.

(3) *Time.*

It is useless to imagine you can give a time limit to a writer, even though he be an experienced soldier, to produce one of these monographs of battles. The witnesses may live hundreds of miles apart, for since the war those that took part in the fighting have gone on their several ways and it takes time to find them. Once found they have to be written to, their answers received, questionnaires dispatched, criticisms made, and further answers awaited which are often very long in coming.

It may surprise my readers when I tell them that it took me four years to write my little pamphlet on "Neufchâteau," five years "Ethe," the same for "Virton," seven years to produce "Verdun," and it was not the actual writing but the collating of the documentary evidence that took the time. It is true that one can write several at the same time. I have had "Rossignol" on the stocks for five years and "Montdidier" three, and they are not ready yet. No doubt I shall rough out others before these are published, but my point is that one must not be hurried, for though no doubt one could produce an interesting story in a given time it would perforce be inaccurate and consequently dangerous from the instructional point of view for which it is intended.

How to ask for information.

Your witnesses being all the general officers and one or two officers of each of the units of all arms, the question now arises of how to interrogate them. Should they simply be asked to tell

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the story of their battle verbally or in writing? By doing this you might obtain lively and interesting accounts but they would lack accuracy and would not fit in with one another; insignificant events would assume undue importance and essential facts might be omitted. To get good results you must give a line to witnesses on which to base their statements. The objection may be made that if you know already what you want them to tell you about, why have witnesses at all? It leads to a vicious circle. This may be so to a certain extent, but none the less it is the best way to get at the truth.

Before consulting any witness you must study the battle carefully, making use of everything that has been written about it, all documents and records you have been able to get hold of, as well as the more or less detailed notes that higher commanders have consented to send you. From these you get the tasks officially given to each regiment, and possibly to some of the battalions. After you have been through them and have gone over the ground, certain points will seem obscure or incomprehensible.

You will now be able to send a first questionnaire on detail to the regimental commanders. They will certainly be able to give the locations of their battalions at critical or important times. They may be able to correct mistakes in the first documentation and furnish many useful bits of information. After this you will be better equipped to consult battalion commanders.

The questions put to battalion commanders will be fuller and more detailed than those put to regimental commanders and their replies will be much more definite, though here the problem becomes complicated. Facts will be disputed. Such and such a battalion was not *here* but *there*. It did *this* not *that*. The companies were *here*, *here*, and *there*. The colonel's orders never reached them and consequently were not carried out . . . . and discussion becomes animated, but the historian begins to form his own idea bit by bit.

Next comes the stage of sending questionnaires to company, battery, squadron, section commanders and any N.C.O's who may have been in command of detachments. Here again you will receive a sheaf of conflicting evidence—indignant denials—each company won the fight on its own and the next company did

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nothing. You will get some facts out of it all and a good many illusions and will have to use great judgment as to what to accept. You can imagine what a huge pile of paper you have collected by now . . . . How are you going to sort it out and use it?

Use of documents.

Here the only rule to be observed is to start with no preconceived idea; to abstain from criticising favourably or otherwise points of doctrine; but to devote all your attention to letting the facts speak for themselves and to avoid altering them in any way. Theoretical teaching is not everything. On the battlefield more depends on the character and fighting value of the combatants than on theories however brilliant. One commander with initiative and given good men may make a mistake and yet gain a success, whereas another brilliantly conceived operation under another kind of commander may meet with bad punishment.

So, once again, avoid preconceived ideas, and stick closely to facts . . . . You will have literally hundreds of these stories in your *dossier*. Are you going to use them all? Certainly not. You must pick out of this store of episodes some that are characteristic and reject others of small importance . . . . Next the selected incidents must be co-ordinated having regard to their relative importance and without leaving out any essential point. To do this you prepare a table. The first column contains all the hours of the day, brought from 0 to 24 in quarter-hour periods. The second column is reserved for the command and orders given are put in opposite the time in Col. 1. Next columns are reserved for each regiment and sub-divided into secondary columns for battalions and companies. In each of these columns opposite the time in Col. 1 the information with its references is briefly recorded. Other columns are added for the other arms. A "remarks" column contains general information not contained in the others.

This takes a long time, but on it depends the whole value of the work. It has the advantage over an index system in that you can review the whole situation at any time of day at a glance. It frequently enables you to understand facts you were doubtful about previously, and which this record has enabled you to corroborate. You see clearly the times that all orders were dis-

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patched to the combatants; if they arrived late or not at all. The influence of a partial success or failure on the progress of neighbouring troops and on the general result of the operation is brought out. Finally you see what the main factor was that led to the success or tactical failure of the fight. It is hardly necessary to say that when this tabulated form is complete, say in several months' time, the whole work is still far from completion. The framework is on a sound basis. The next task is to divide the various columns into chapters bearing as headings the most interesting manœuvres of the various units during certain periods of time.

Editing.

Next comes the actual writing of the account and this requires a certain facility of pen. This is not easily learnt . . . . but if you make a practice of reading carefully an author whose style is markedly clear and good, you may be able to copy it. It is as well to choose for your model one who writes short sentences. Some historians read a page of Voltaire before setting to work and find it a good plan. Your chapters should be short, so that your reader can stop often and make himself clear on developments that may be obscure and hard to follow. Your narrative must be alive. You must make your reader feel as if he is in the fight and taking part with the combatants; make him feel the misery of having made a mistake and the punishment caused by it. To get this result you must not only be deeply interested in the subject yourself but you must get to know as intimately as possible many of those who took part in the battle . . . . Do not hesitate to mention the names of the participants—excepting when you are describing regrettable incidents when the disclosure of names would hurt their feelings.

Conclusion.

The conclusion arrived at in this article is that the only way to make these battle studies really useful is to subordinate everything to the actual truth, and to devote all the time necessary for arriving at it. You must remember that they take a long time to produce and that much discrimination must be used in the acceptance of evidence. Truth must never be sacrificed for effect, and if you do find yourself faced with insufficient, or uncorroborated

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evidence about the action of a certain unit in the battle you are describing you must leave a gap, with a note to the effect "it is impossible to say . . . ." and not draw on your imagination or doubtful evidence. The truth and nothing but the truth must be told here unless you wish your completed work to be utterly unreliable.

As for the rest—methods of tabulation, composition and publication—these are a matter of practice, but the most important fact of all is that the men who write these accounts of battles must be keen and interested in their work.

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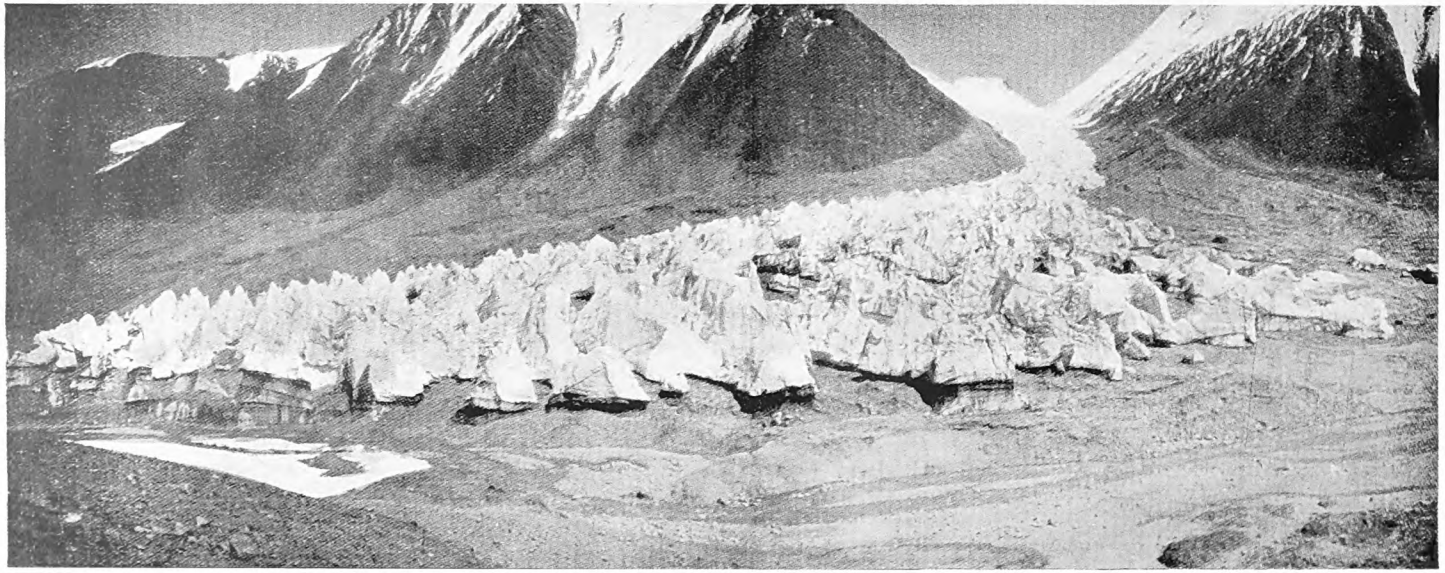

Seracs of a glacier on south side of Lungmo Che (Valley 1), tributary of Yarkand River from the west.

View of Depsang Plain.

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THE CARAVAN ROAD TO SINKIANG.

By Lieut.-Colonel G. K. Gregson, d.s.o., R.A.

THERE must surely be very few who, having once pitched their camp in a remote valley of the Himalaya, escape the longing to return and penetrate further than before into the great mountain barriers which lie between India and the Central Asian Plains. When the opportunity presented itself of travelling the whole road, from the first foothills near Rawalpindi to where the last spurs of the Kuen Lun peter out into the Takla Makan, we at least abandoned all other projects for the summer of 1927 and set about our preparations for this long expedition. Official correspondence in connection with the trip lasted from June 1926 till we left Srinagar in May 1927—by when we were complete with all our permits and Parwanas, letters of introduction and kind promises of help by the way—all, in fact, except our Chinese passports, for the reason that no one knew quite who should give them.

April in Srinagar is much as in England—sleet and slush, raw winds and red noses, or so it was in 1927.

Preparations for the great trek fell under four headings—servants, equipment, supplies and transport.

The first was much simplified for us by my having engaged my old shikari, Mohammed Rattar. For our inspection he produced cooks and coolies, amongst the latter being three of the very best Kashmiris I have known. Ramzana (the name conveys less than Jones in Wales), tiffen coolie and staunch retainer on previous expeditions, Moham Du and Guffara, of good physique, cheerful, willing and as hard as nails. Hyat Loen, the cook, completed our Kashmiris.

As far as Leh the ordinary coolies' and the sweeper's wages were to be Rs18 p.m., Rattar's Rs40, Hyat Loen's Rs35 and Ramzana's Rs20. We were advised not to take the Kashmiri coolies beyond Leh but did so and never regretted it, though we could perhaps have managed with fewer. One other personal servant we had—Budloo Bux, my bearer, a Sunni Mohammedan like the Kashmiris with whom he was always on the best of terms. A first-class bearer

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in cantonments, Budloo was a plainsman of no great physique nor appearance of hardihood. Yet throughout all our wanderings and hardships he "stuck it" with a solemn cheerfulness, thinking only of our comfort and anticipating our every need.

For tentage we took two 80lb. double fly tents and three servants pals. Of the 80 pounders one, our sleeping tent, had all the walls lined inside with puttoo for warmth. The lining covered the front and back walls to the pole tops, leaving only the roof unlined. In this tent we were able to sleep moderately warm with snow on the ground, 24° of frost and bitter wind. The lining was heavy and the total weight of the tent increased to about 120lbs.

Clothing was cut down to a minimum but had to meet the requirements of extreme cold and the considerable heat of the Sinkiang deserts. Footwear presented a difficult problem since no proper repairs could be carried out at any place on our journey. We took good crepe sole sambhur hide boots which were very light and proved invaluable, and shooting boots which were heavy and soon wore out. Two pair of strong chaplis each and four pair of leather socks for them, and quilted Gilgit boots completed this part of our outfit. Our servants were supplied with chaplis, warm clothing, a thick blanket and a fur-lined coat each. Weapons included one ·275 Rigby-Mauser, one ·375 Mannlicher, one 12 bore gun and a ·32 Colt automatic, with 100, 50, 200, and 25 cartridges respectively.

It would occupy too much space to enumerate every item of our equipment, but though we tried to keep everything down to a bare minimum for tolerable comfort on the journey, there accumulated in our rooms at Nedou's Hotel and the verandah outside a mass of articles which, with our supplies and clothing, spelt many pony loads. Presents such as watches, knives and magnifying glasses for the local inhabitants, numdah saddles and camp furniture, books, chess and writing materials, ice axes, khud sticks and a climbing rope, two cameras and 200 films, kitchen and table utensils and a medicine chest, this last large enough for a small travelling dispensary, which we were warned might be expected of us in Sinkiang. Our list of supplies was based partly on that of the De Fillipi Expedition of 1914, of which we were fortunate enough to obtain a copy, and partly on our own previous

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experiences. The list was divided roughly into three groups, i.e. those articles which could be renewed at Leh; from the oases of Sinkiang; and not renewed at all on the journey.

Permission to travel viâ Gilgit and Hunza having been refused we had to go and return viâ Leh and the Karakoram. The trade route from Leh to Central Asia is that known in the Turki language as the road of the five passes. These being, in order from Leh, the Khardong, Sassir, Karakoram, Suget, and Sanju, respectively 17,600, 17,600, 18,300, 17,618 and 16,650 feet above sea level. Alternatives to the first and last are the Digar and Kilian. There is besides a winter route up the Shyok valley, reached from Leh by the Changla, which avoids the formidable Sassir Pass but includes the last three on the main trade route. The winter route is, however, longer and therefore more costly in transport, and, on account of floods a most doubtful passage after the end of April. For these reasons we decided to keep to the main trade route.

This road is seldom open for normal traffic before the middle of July, and since by waiting till then there would be no time to spend in Sinkiang, nor for any exploration off the trade route by the way, we decided to take on the Khardong and the Sassir at the earliest date a caravan could be persuaded to accompany us.

After some adventures and shikar on our journey from Srinagar we reached Leh on 26th June and the next morning discussed arrangements for our journey to Sinkiang with Bahar-ud-din, a Yarkandi merchant with whom we had already corresponded. He said his ponies would cross the Khardong *unladen* at once, but it was for us to arrange with the Tehsildar for yaks to take over our baggage.

After some bargaining we agreed to hire 27 Yarkandi ponies for the whole trip at ₹100 per pony for the outward journey and ₹55 per pony returning, with, in addition, ₹3 per day per pony taken off the trade route for shikar, exploration, or other purpose. For Karakash (caravan leader) we engaged a young Argon (half-caste Ladaki-Yarkandi) named Ibrahim who had been with Major Mason's expedition to the Aghil Range and Shaksgam valley west of the Karakoram Pass the year before.

It was more difficult to arrange for the yaks. The yak drivers funked the pass which was still deep in snow and had not yet been

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opened. Every sort of excuse was made to delay our start—the yaks were scattered grazing and couldn't be collected for four days—storms were coming, and so forth. Eventually we extracted a promise that for Rs3 per yak the men would go and that the yaks would be collected at Polu at the foot of the pass by the evening of June 30th. We were warned by the Tehsildar that it was highly probable we should lose several of them during the ascent and that I would have to pay compensation to the owners of any that died.

Apart from other considerations we had to push on as fast as possible since the bridge over the Shyok river below Satti which had been carried away the year before had not been repaired and we should have to ford the river. As the passes open the rivers rise, and soon the ford at Satti would be impassable.

The evening of June 30th found us all assembled at Polu. Ibrahim's Argons were his own choosing and included two first-class fellows in Yasim Beg and Ghulam Hassan. North of our camp lay the smooth untrodden snow slopes leading to the summit of the pass 2600 feet above us. It looked too close and easy to make such a pother about.

The advanced guard, consisting of 8 unladen yaks which were to wait below the worst part near the summit and take the loads from the dead and exhausted, started off next morning at 4 a.m., and the whole outfit was on the move by 5. We had three riding yaks for such as might need them, but they proved quite useless and I sent them back soon after we had begun to climb in earnest.

There was no sign whatever of where the summer track lay and soon every yak was floundering to his belly in the soft snow—the whole twenty of them justifying their scientific name in a chorus of grunts like the firings of an array of oil engines. Progress became slower and slower and petered out entirely at about 800 feet from the top. We stood scattered all over the face of the pass. The arrangement to send on the eight unladen yaks was made without our knowledge. No responsible servant was sent with them, the drivers had stayed for no man and the whole advanced guard had appeared on the sky line long before as it passed over the summit. Of the laden beasts nearly half lay in the snow utterly exhausted from the height and heavy going. One of these staggered to his feet and died, his body and the load of four boxes of groceries racing

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down over the snow and ice. A Ladaki driver tried to stop one of the loose boxes and was knocked down with his lip cut and a broken tooth for his pains. Baggage was pulled off and thrown on the snow and a second yak, apparently lifeless, began to slip down the slope, a Kashmiri hanging on to his tail. Far below us on the first white swell of the steep face we saw Ibrahim with his men and ponies turning back towards Polu.

Something approaching panic set in amongst the yak men, and those of us who might have stopped it were too scattered to do so. Between the yaks now staggering unladen down the slope and the retreating ponies was my shikari Mohammed Rattar, using most unparliamentary language to the Lambardar of Leh who had been sent to supervise the yak drivers. This same lambardar had come to me whilst the Polu camp was being struck and asked for baksheesh. He was told he would not get his reward till every bit of baggage was safe over the other side. Whether for this reason, or angry at Rattar's oaths, he never lifted a finger to help us in our difficulty. A few drivers, minus their yaks, still sat about the slope, and these now, with our Kashmiris were persuaded to hump the discarded baggage and by very slow degrees carry it up. Rattar and Ibrahim, almost back at Polu, rallied some more drivers and some coolies who had accompanied the lambardar, and Rattar returning with this party gathered most of our remaining property.

It was by now 10 o'clock and hopeless to make Khardong village as we had intended. The north face of the pass, for 1500 feet or so, is a steep snow field, and down this the baggage, sometimes several pieces lashed together, and the coolies glissaded, fortunately without mishap. We came up with the eight advanced guard yaks about 4 p.m. and decided to camp on a level bit of grass 2000 feet above Khardong village and four miles short of it. By 9 p.m. there was no sign of the ponies and we gave up any hope of their crossing till next day. From the camp we could still see the crest of the pass and were out soon after dawn on 2nd with telescope and glasses searching the slopes. The ponies appeared on the skyline at 7.30 and were at the camp two hours later. They had refused to face the deep snow the day before. Back at Polu, Ibrahim had sent for a goat, and before dawn on 2nd the procession had formed with the goat-herd leading. The goat had followed

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him somehow through the snow and the ponies had struggled after the goat. This is apparently an old dodge.

By 11.30 a.m. we had paid off the coolies and yak drivers, giving baksheesh to those who had done well, and reporting in a letter to the Tehsildar the bad behaviour of those who had bolted or had gone on with the eight unladen yaks over the pass against instructions, and were on the stony track to Khardong village with our baggage on the ponies.

Some important pieces of our property were, however, still missing, and we had had to send two of our Kashmiris, Guffara and Moham Du back to find them, collect coolies, and bring them on after us. The rapidly rising Shyok River had still to be negotiated and a day's delay might mean we should have to wait three weeks or more till the pontoons then on their way from Srinagar, had arrived to form a ferry for the caravans. Past Khardong village the track plunges into a deep gorge and through scrub jungle to Shyok valley. Our first sight of this was towards evening, and very beautiful it looked with its broad white beaches and the sunlight on the eastern slopes.

The Shyok river is subject to sudden and dangerous floods later in the year, but now was running slowly and steadily. By 6.30 p.m. we were at the water's edge and Ibrahim and another of the Argons went in mounted to find the bed whilst the caravan waited on the bank. The river ran very smooth but was some 300 yards broad, a heavy water and not a very pleasant proposition in the dusk for the laden ponies. Other caravan men went in on foot, waist deep and singing lustily. Between us we found the twisty shoal water and the caravan followed in slow-moving snake-like formation. All the ponies were soon in over their girths and one put its foot in a hole, plunged and drenched its load. We had other anxious moments but all eventually landed safely on the right bank with no more amiss than some wet baggage. The lambardar and villagers of Satti came down to meet us carrying torches and led us to the camping ground through lanes of dried thorn bushes. Our camp was in a willow bagh and we rested there next day.

On 4th we marched to Tegur in the Nubra valley and on 5th to Panimik, arriving there by mid-day after a five hours' march. This is the last halting place in Ladakh on the Karakoram road,

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and except for one small village just beyond it, the last human habitation we were to see for nearly three weeks. Ahead of us lay barren wastes where supplies are unobtainable and across which the caravans hurry to avoid starvation leaving their trail of dead. One nèeds no map to find the way. If in places the feet of men and animals leave no impress on the stony ground the whitened bones and the stench of rotting carcasses are guide enough. We spent next day in Panimik collecting some more supplies for the men, a herd of six small goats for milk, eight sheep for meat and four zoës—half-breed yak-bail cattle—to carry fuel. A jolly little Ladaki lad volunteered to come with the goats under the impression, we found later, that he was to return after crossing the Sassir. Guffara and Moham Du rejoined us with nearly all our lost property. In four days, in which must be included a day spent near Polu, they had crossed the Khardong twice and had covered about ninety miles.

At Panimik Ibrahim engaged another caravan man, one Wandus, a pure Ladaki, the only buddhist of the whole party, a splendid fellow who rejoiced in doing three men's work and was always ready to lead in the bad places where others doubted. Our eight sheep cost us Rs35. We paid nothing for the goats at the time, but as all perished by the way gave Rs20 for the six on returning to Panimik in September.

A little party of villagers, headed by the jolly old Zaildar, his Munshi, and the Kotiawal, came to see us off on the morning of July 6th. No caravans had yet arrived from Sinkiang, but the Zaildar told us that one party was two days ahead of us. This party had left Leh before us, crossing the Digar Pass instead of the Khardong.

Six miles up the Nubra valley from Panimik is the junction of the Thulanbuti gorge—an impassable gash in the granite cliffs. The track leads up a granite face just north of it, zig-zagging for over 1000 feet in fairly easy gradient and in many places blasted from the rock. As we ourselves reached the top the caravan, looking like a procession of ants, was winding across a wooden bridge at the bottom of the cliffs. For a short distance from the top the track is more or less level and then, by another similar zig-zag drops 500 feet to Umlung—a name without a place, like

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so many on that road, but for many miles the only level spot available for camping. The last big loop of the track above the camping ground drops 150 feet from the angle to the valley bottom. Looking up from this the head of the caravan appeared at the angle and I was horrified to see a pony plunge forward off the track and over the edge. It shot down the smooth rock, an almost sheer fall, and crashed across the path behind me. A kindly bullet soon put an end to its suffering. Every leg had been broken and its jaw badly shattered. It was one of our best riding ponies, a Yarkandi stallion, and Rattar had been riding it only a few minutes before the accident.

From Tutyalak, our next halt beyond Umlung, to the summit of the Sassir is about 11 miles, the usual "parao" or march being to Brangsa Sassir five miles the other side and just above the right bank of the Upper Shyok. The snouts of three glaciers block the valley leading to the pass on the west side and have to be negotiated. The party ahead of us had already opened the pass and a few Yarkandi from the caravan from Sinkiang had crossed to the Tutyalak side. We decided, however, not to make the full "parao" in one day, since to reach the glaciers before the crust of the snow was melted by the sun would entail a midnight start and a difficult approach in the dark. On July 9th, therefore, the caravan moved up eight miles to Sartang, and soon after leaving Tartyalak we were in snow again for the first time since crossing the Khardong. About half way a broad tributary valley joins the main stream from the Sassir glaciers. It was completely snow covered but the snow crust was rotten in places above the stream and the crossing cost us a zoë, the unfortunate beast falling through a snow bridge and being drowned in the stream ten feet below the snow surface.

We reached Sartang soon after mid-day on 9th, off-loaded and pitched the camp on about an acre of shale and detritus clear of snow and close by a frozen lake. Glaciers hung on all sides and a wilderness of snow and ice surrounded us with only the moraine banks to relieve the white monotony.

Some of the Argons were despatched with ice axes to find and improve the tracks made by the first parties across the glacier snouts, and to their efforts we owed to a great extent our safe crossing next day. At 4 a.m. on 10th the camp was astir. Snow had

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been falling for some hours and, driven by a bitter wind, continued steadily as the caravan moved off at 4.45. It was pitch dark and the men called to each other and sang to keep touch—no doubt also to propitiate the bogies which they believe haunt the mountains. After negotiating a big moraine we kept along a very narrow cleft between the snout of a glacier (in places a clear ice wall) and the rock face on the north side of the valley. Then up over the glacier itself as the first light began to penetrate the scudding clouds. Ponies slipped and fell, some lying still on the snow till their loads were removed. Progress was very slow and the storm was over by the time the caravan reached the second glacier. The sun, otherwise so welcome, now thawed the snow crust and the going became proportionately worse for the laden animals. The watershed was indistinguishable in the tumble of snow and rocks and it was nearly 9 o'clock before we realised that it was already behind us and the worst over. Here one of the Kashmiris collapsed—the only casualty amongst them during the whole trip. He lay moaning in the snow and for a time seemed pretty bad. His pulse was feeble and over 130. We gave him sal-volatile and got him onto a pony. He seemed none the worse next day and later survived days quite as strenuous and at greater height.

At Brangsa Sassir, a cold and dreary spot, we found a Yarkandi merchant sitting in a big tent surrounded by his merchandise. He offered us refreshment and told us we should find the road ahead fairly good. He seemed a pleasant, kindly fellow and took our mail letters on to Leh with him. At this place the Kashmir Government keeps two men to watch the ford over the Shyok River and report its condition to travellers and guide them over. The water was still low and our caravan crossed without difficulty about 9.30 a.m. on July 11th. A little down stream from the ford the narrow Rang Nala joins the Shyok left bank. We were greeted at the entrance to this gorge by a coffee-coloured flood in which great blocks of ice were being tossed about like corks. This was evidently something more than the normal snow-melt and was no doubt caused by the bursting of a small ice-dam further up. There was nothing for it but to off-load and wait. The gorge is in places only 15 yards broad enclosed by absolutely sheer precipice, and a caravan caught in it by sudden flood water would be in grave danger. We waited

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for two hours whilst reconnaissances gradually penetrated further and further through the defile as the flood lessened, and eventually got on the move again at mid-day. We had some difficulty in places and at one time, for about half a mile, found the bottom of the gorge completely blocked by ice to a depth of about four feet. Fortunately the top was sound so we were able to get on over it to where the valley opens out and the track leads over a small pass to Chang Tash lake.

We found our camping ground that evening at Murgo very pleasant by contrast with Brangsa Sassir. It was still, and warm enough, and we walked down to where the winter track from Kataklik joins the Sassir route. We were in limestone country again and fantastic red cliffs faced us above the next day's track up Murgo gorge. Murgo is the last place on the trade route where there is even scanty grazing till Chinese territory is reached. It is also the last place where fuel, in the shape of "Burtsi," can be obtained in any quantity and we took on as much as could be collected and carried. The next day's march to Kizilyat is a nightmare of desolation—20 miles, mostly in a broad stony river bed without sign of vegetation or life. It became quite unpleasantly hot at mid-day and there was no shade.

Our goat-herd having deserted at Brangsa Sassir, the sheep and goats had been handed over to the care of the Kashmiris Moham Du and Habiba. Half the goats had already stopped giving any milk and we began to regret having brought them. The sheep were a necessary precaution in case we should be delayed anywhere where game could not be found. The whole 14 foot-sore hungry little beasts came into camp just before it got dark, having taken ten hours for the 20 miles. The weariest had been carried in turns on the two ponies which accompanied the party.

Arrived at the camping ground, which has literally nothing to distinguish it from the surrounding wilderness except a few more skeletons than the accustomed number by the way, the hungry ponies were tied in pairs head to tail to prevent them wandering off in search of non-existent grazing. This was the usual routine. They remained tied up till about 6 p.m. when they were taken to water and then had about 1½lbs. of barley, half their daily ration, given in a small nose bag. The other half of the ration was usually

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given about half an hour before the caravan started in the morning. The ponies are got into fairly big condition before leaving Leh, but those that reach Sinkiang are by then usually reduced to skin and bone from their starvation diet on the road. As they have to carry all their food the best ration to get them across alive becomes a nice matter of adjustment after years of experience. Many die, but Ibrahim's management got his safely through the double journey—excepting only the one killed at Umlung.

On the night 12th/13th July there were 14° of frost in our fairly sheltered camp. On 13th the sheep and goats were on the road by 6 a.m. and the head of the caravan left three-quarters of an hour later. We continued on up the seemingly interminable stony river bed—climbing more steeply. The little stream was soon almost frozen over and it was not until we had begun the last ascent to the Depsang Plain that sunshine reached and warmed us. The so-called pass onto the Depsang is 17,780 feet, and the whole track across the plain, until it drops to the Chip Chak river, is approximately at the same altitude. The plain is stony and undulating and offers no shelter of any kind. Luckily for us 13th was a still, cloudless day. In every direction are panoramas of distant snow peaks. Tehram Kangri and Depsang peaks were distinguishable, and it was with the greatest interest that we saw for the first time the peaks by the Karakoram Pass and the snows of the great glacier region N.W. of it. We found the march pleasant and easy, though the caravan moved at little more than 2 m.p.h. On approaching the Chip Chak we saw some Tibet antelope. They were does, about 1000 yards from the track, and moved off on seeing us. Fording the river one ascends slowly past Daulat-Beg-Uldi and the former Chinese boundary post at Pulo, the latter actually boasting a landmark in the shape of two small ruined huts formerly used by the Chinese frontier guard.

We camped that night at the place known as Chajosh-Jilga, about two miles beyond the Pulo huts. Anything more dreary could hardly be imagined. Conglomerate and rubble surrounded us on all sides. The stream, milky from its source in a snow field, was fouled by the rotting carcases of ponies. A wind howled from the Karakoram Pass and blew the dust in swirls and eddies about the tents. The temperature fell to 14° F. during the night, but

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in spite of it and the wind which continued till the small hours we passed a warm night in the puttoo-lined tent. Next morning as we were moving off we met an Austrian journalist and his wife who said they had come from Russia through Sinkiang and were on their way to India—a queer couple who lived and ate their meals with their caravan men.

Nine miles up the valley the trade route bends up to the right to the Karakoram Pass. Here eight caravan ponies and the five donkeys with such of our supplies and baggage as we should not require for the next fortnight, Moham Du, Guffara and three of the Argons, continued on over the pass with instructions to wait for us at Suget Karaul and, with the rest of the caravan, we turned off the beaten track.

To guide us during the détour which we wished to make we had Major Mason's report to the Royal Geographical Society of his expedition to the Aghil Range and Shaksgam valley in 1926, and the map published with it. Ibrahim having accompanied this expedition his previous knowledge was most valuable to us, although his recollection of distances and of the topography generally, was often at fault.

About a mile after leaving the trade route we found the snow field which, lying at a little under 18,000 feet, is the source of two streams, the waters of one flowing S.E. to the Indian Ocean and of the other N.W. to Sinkiang where they disappear in the sands of the Central Asian Deserts. We followed the stream flowing N.W. The gradient is gentle and the going good if one avoids the boggy places. The prospect soon becomes pleasanter. There is more vegetation and one encounters no gruesome remains by the way. Beyond the watershed snow we heard the delightful bubble of sand grouse, and three fat birds were soon added to our larder. We passed the place used by the de Fillipi Expedition of 1914 for a supply depot and saw the traces of one of Mason's camp fires. The stream, a mere trickle where it leaves the snow field, is fed from glaciers in the side valleys, and by 5 p.m., when we were still two miles from its junction with the Yarkand River, it presented a serious obstacle. The valley is here much more restricted and one is forced to ford the stream several times—a most unpleasant operation in the icy water. Tents were pitched that evening under

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a shingly bank about half a mile from the Yarkand River at the southern edge of Wood's Amphitheatre.[1] We had marched 18 miles and were all pretty tired on arrival, the ponies being badly tucked up. The latter were turned out onto the grazing which we found fairly plentiful on the far bank of the Yarkand River. "Burtsi" fuel was collected and soon our camp fires were blazing—a prelude to hot baths and good dinners. "Q" Branch, for which M. was responsible, as usual worked perfectly. Make no mistake, you who would go to places beyond even the crudest civilisation or the dwellings of men—your commissariat must be the best you can get and there must be a sufficiency of good food. Lack of it courts weakness and even illness, as to which last your situation may be an extremely unpleasant one.

A "yurrup" morning next day, July 15th. After breakfast M. and I climbed across to a knoll about two miles from camp and took panoramas looking S.W. to the glaciers near the source of the Yarkand River and N.W. including the nineteen and twenty thousand-foot peaks of the Aghil range above the left bank of the river.

On 16th the whole caravan forded the river just above the junction of the stream followed on 14th and continued on past Hayward's Lake to camp under the lee of a cliff on the left bank. The shikar party made a détour through the foothills farther west. Only antelope does were seen during the morning, but when approaching the camp in the afternoon Rattar spotted two bucks on the right bank. The shikar party was able to ford the main river without difficulty but open ground made it impossible for me to approach nearer to the antelope than about 400 yards. I did not then realise how absurdly unsophisticated they are in places where man is almost unknown to them. Both fed down towards us as we lay watching them, and the better head gave me what should have been an easy shot at 200 yards. Unfortunately I wounded it and the pair ran about amongst some rocks so that it was difficult to distinguish them apart. As a result I fired at the unwounded buck and killed it—afterwards despatching the other. The heads were disappointing—24 inches and 23½ inches. I had

[1] So called from the report made by Major (now Colonel) Wood, Survey of India, who accompanied the de Fillipi Expedition.

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hoped for 26 inches, but though several others were bagged later both in the Upper Yarkand and Lungmo Che valleys, in each case the best of a herd, none exceeded 24 inches.

We camped again under the shelter of a cliff. Snow fell steadily all night and lay thick on the tents when the shikar party moved off at 4.30 a.m. next morning. We had left the carcass of one antelope on the ground in the hope of finding snow leopard or wolves on it at dawn. On reaching the river we found it rising very rapidly and had to abandon the attempt to reach the right bank. Old droppings of snow leopard were frequently seen in the Yarkand River and Lungmo Che valleys, but never any fresh ones, and the animals were probably all higher up in the side nalas.

That night we camped about 14 miles short of the junction of the Lungmo Che valley, crossing the left bank tributaries of the Yarkand River without difficulty. In the quietness of the afternoon when the tents were pitched we did not trouble about shelter. A stiff breeze sprang up towards evening and with 24° of frost on the ground we passed an unpleasantly cold night. Ibrahim, never happy off the trade route, tried to persuade us that we had already passed the Lungmo Che junction. One object of our détour was to look for the big burhel which were reported[1] to be plentiful in the Lungmo Che. The junction is at the point where the Yarkand River turns north-east, and cannot be confused with those of tributaries higher up the left bank. The caravan did not start till mid-day on 18th and was sent only six miles down stream. From 10 a.m. the sky was overcast. The river remained low and the shikar party was able to cross and recross the main stream with ease. Whilst searching the right bank for antelope we found the skull of a yak, one horn of which had been sawn off. Through a misunderstanding this skull was not brought on with us. At the time we concluded that the animal had been with one of the previous expeditions, but I have been unable to discover that tame yaks were ever taken there. We also found the unmistakable

[1] *Extract from Geographical Journal. Report by Major Clifford, I.M.S.*

"Also on the lower slopes . . . . . of the Lungmo Che there were large herds of burhel, which were undoubtedly the same species as are found nearer towards India, though heavier in the head than those found towards the Karakoram Range . . . . . We found dead heads of 36 inches, which is an enormous size compared with those which are nowadays shot on the nearer ranges . . . . . We never saw a live head of more than 28½ inches."

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droppings of yaks, both in the Yarkand and Lungmo Che valleys, and from such evidence as we have since been able to collect conclude that the traces we found are those of wild herds.

On 19th we continued down the Yarkand River to the point where it begins to bend N.E. On the left bank the high cliffs here fall away, and by turning up N.W. across undulating ground we struck the Lungmo Che valley about five miles from the junction.

In Major Mason's report to the Royal Geographical Society of his expedition to this region in 1926 he gives as one of his objects :—

"To explore for traces of any human occupation or passage, ancient or modern, in this area."

In the discussion following the report he said :—

"Actually we found no traces of treasure or travel, ancient or modern, except the body of a man (in the Lungmo Che, probably died in 1924). But though I believe this corpse to have been a straggler from the caravan route, at least four marches distant, and though the saddle-bag discovered by Wood (in 1914) may have the same interpretation, I still believe that it is possible there was an ancient way, by which a few people, possibly Kalmuck Tatars, robbers, or fugitives from justice, might have migrated or escaped. If they did so, they must have chosen October, for this would be the only month when they could get through the gorge above Khufelang, up the enclosed valleys and gorges of J, over the Aghil Dipsang and Tatar La, across the Shaksgam and its tributaries, and still be fit and ready to tackle the glaciers and passes of the Karakoram, before cold and exposure would exterminate them."

A glance at the map will show that so far as distance alone is concerned it would be far easier for us to return to the trade route from the Lungmo Che valley by Kufelang and Aktagh than by retracing our steps to the Karakoram Pass. It seemed a forlorn hope but worth sending a reconnaissance before deciding what to do. So, early on 20th Ibrahim and Ghulam Hassan were despatched with instructions to report whether a caravan could reach Kufelang. They were warned that the fords might be dangerous and that they must not go on into the narrow part of the gorge if there were signs of serious flood. Meanwhile, on the same day, the shikar

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party worked up the left bank of the Lungmo Che to a point midway between the snouts of two glaciers on the opposite bank and about 15 miles above the junction with the Yarkand River. Each of these glacier snouts is broken into a mass of seracs and the scenery at our farthest point was wild and beautiful in the extreme. One herd of 19 burhel was located and approached. Closer inspection proved them all to be ewes and small rams, the biggest head amongst them being no more than 20 inches at most. Burhel make very distinct tracks on the hill sides and we failed to discover any others than those made by the herd seen.

Time did not admit of further exploration in this most interesting country. Indeed, since it seemed very probable we should have to retrace our steps to the trade route by the Karakoram Pass, we decided it would be advisable to move on 21st to near the junction so as to be ready to move up or down the Yarkand River according to the results of Ibrahim's reconnaissance. Soon after mid-day, therefore, on 21st the caravan was on the move again, keeping along the high ground above the right bank of the Lungmo Che. Antelope were seen and another 24 inch head shot. The whole body was left absolutely untouched on the ground for bait about a mile from where we camped that night near the river junction. Shortly before reaching our camping ground Ibrahim and Ghulam Hassan rode up to meet us. They had been through to Kufelang and had found three fords which they reported passable for the caravan before 10 a.m. each morning.

All through the Karakoram, Himalaya and Kuen Lun mountains we found that the rivers began to fill up between 9 and 11 a.m. according to the distance from the glaciers and snow fields. A roaring torrent at 5 p.m. became easily fordable after a comfortable and not too early start from camp next morning. If the day's march included at its commencement the passage of a river, it was better not to get on the move too early. The lowest water was generally to be found between 8 and 10 a.m. On July 22nd the shikar party rode out an hour before dawn to look at the carcass of the antelope shot the evening before. We left the ponies in a hollow and approached with great caution, waiting amongst some rocks 600 yards from the bait and down wind till it was light enough to see. The body was exactly as we had left it, and there was not

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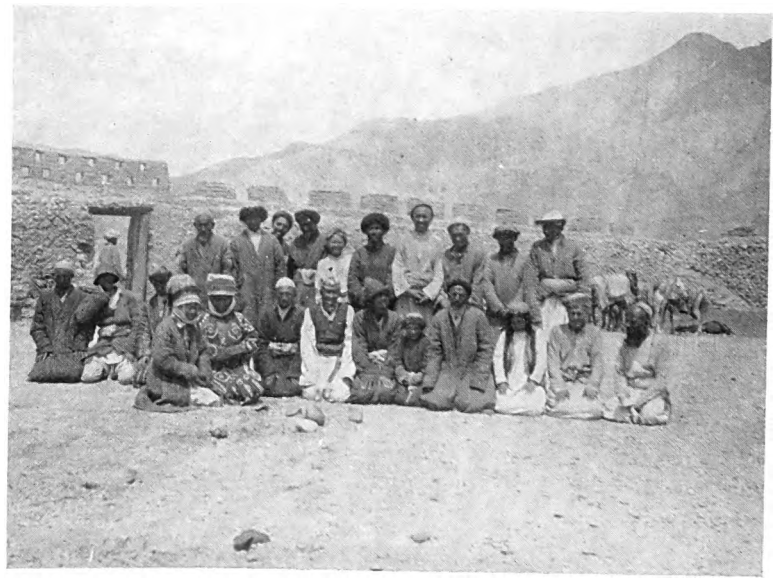

"Kirghiz families in Suget Fort."

"In Kufelang Gorge."

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the slightest indication that either beast or bird of prey had approached it. We removed the head and returned to camp.

At 8.30 a.m. the caravan moved off to the first ford just above the junction and crossed without any serious difficulty. Wandus and the Argons waded over holding hands and singing at the top of their voices. Moving on down the right bank we were delayed by some deep side nalas but made steady progress and by 5 p.m. found ourselves near the second ford. The river being then in spate we chose a pleasant camping ground under high cliffs near good grazing. Both at this place and at the previous camp we found an abundant supply of low bushes (umbu) for fuel. The narrow part of the gorge above Kufelang still lay before us and we watched the river anxiously, making an early inspection of the next ford on 23rd. At this point the river flows in two main channels and several subsidiary ones. The caravan moved off at 8 a.m., following Ibrahim in single file into the river which by then had fallen about a foot since the evening before and was still falling. The whole crossing, much delayed by getting the sheep and goats over, occupied just under three-quarters of an hour. In the deepest part there was a little over three feet of water—enough to wet some of our baggage and to make us hope it would get no deeper. But the water was nowhere swift and the two main channels not more than 100 yards each. "Khush" the caravan dog as usual was left to his own devices and swam very prettily. "Binks" our bull terrier and the farmyard, the latter by now much reduced in numbers, were carried over.

We were now on a narrow beach on the left bank and in the narrow part of the gorge. Had the river risen suddenly our case would have been difficult. The next and last ford was about five miles on and we lost no time on the way. The ford proved easier than the second, though the water was quite obviously rising, and by 11.30 the whole outfit was safely on the right bank again, the gorge behind us and an open road before us back to the trade route.

We attributed our luck in making the passage to the weather conditions of the past few days. Except in the early mornings the sky had been overcast and the snow-melt in consequence comparatively slight. The same phenomena occurred each day, viz.

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a clear morning followed soon by a steady cloud drift from the north. During our first few days in the Upper Yarkand valley these clouds were held up by a south or south-west wind which, however, each succeeding day grew less until by 19th the hours of sunshine were few and the sky by 10 a.m. entirely overcast with clouds from the north.

On 24th we passed the dreary Aktagh hill and joined the main trade route again, meeting two caravans from Yarkand. It was bitterly cold with rain and sleet, and the country desolate beyond description.

On 25th we crossed the Suget Dawan—one of the worst marches on the whole trip. With lowered heads for eight hours we faced a driving storm of fine snow, men and ponies disappearing into the surrounding veil of whiteness often at 50 yards—sometimes at as many feet. On the summit the clouds lifted for a few minutes and across the snow slopes below us we had our first sight of China. We had hoped to make the Chinese customs port at Suget Karaul by evening but owing to the exhausted condition of men and animals we called a halt about four miles short of it. The wind dropped soon after dark and we woke to clear skies on 26th. Below us lay the Karakash valley and beyond it the granite peaks of the Kuen Lun. An easy march brought us to the Karaul, a square mud fort crowded with Kirghiz, and Yarkandis with their merchandise. The two Chinese customs officers and a Chinese girl came out to welcome us and entertained us in their little house in the fort whilst our tents were being prepared. Conversation was carried on through an interpreter who spoke both Urdu and Chinese. In almost all other places in Sinkiang we had to employ two interpreters in conversation with the Chinese—one speaking Urdu and Turki and the other Turki and Chinese. No Chinese official we met spoke the language of the country, Turki, and all their work amongst the people was carried out through an interpreter. We found conversation through two interpreters very tedious since the first half-hour of our lengthy interviews was taken up with a competition in fatuous compliments.

We were still without our Chinese passports, and although H.B.M. Consul General at Kashgar had written that these were being sent to meet us in Karghalik the Suget customs officers pre-

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tended that they might get into trouble by letting us through. They made a cursory examination of our baggage—checking my weapons carefully, however, with the list in the Consul's letter. Having displayed their official zeal they at once became most friendly again, and laid the forefingers of each hand together as a sign that we were accepted as comrades for life.

Our flocks and herds were now reduced to one small goat and the fattest and best of the sheep. This last we sent as a present to the Chinese together with Rs10 and a string of beads for the lady. The compliment was soon after returned with interest, when a gaily-dressed Kirghiz servant appeared at our tent door leading an enormous fat-tailed sheep, followed by other servants carrying two fowls, about 10lbs. of rice and three dozen large eggs. This was our first introduction to the Chinese egg—we never really acquired a taste for them. On opening the best one merely had to leave the tent. Others frequently burst from the pressure of decomposing chicken, the resultant mess requiring the offices of the sweeper. We never discovered whether these eggs, which were so frequently bestowed on us by Chinese and Kirghiz alike, were in this condition as being to the donors a special luxury, or with malice aforethought, or merely from carelessness.

We found the servants we had sent on from the Karakoram Pass on 14th waiting for us in the fort. The transport animals, however, had been sent off some miles away for grazing. They could not be collected till the next day, and we were not sorry for the excuse to postpone our departure. The news of our arrival soon got abroad and, as in every other place in Chinese territory where we stopped, the sick and maimed began to arrive by dozens to beg for medicine and treatment. This was M's special department. Her untiring efforts to relieve the suffering of those kindly people will long be remembered by them. The condition of some, however, was beyond our small resources.

The Chinese and a crowd of picturesque Kirghiz assembled to see us off next morning. The Kirghiz and Yarkandi habit of placing the right hand over the heart and bowing for welcome or farewell is very pretty. On meeting us they would sometimes murmur "Khush" (meaning "delighted"), or more rarely "peace be with you"—to which we would reply "and to you also be peace."

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We were still four days' march from the last of the great passes, the Sanjudawan, or Grim Pass. For two days our road lay down the Karakash valley enclosed on each side by sheer cliffs of granite rising many thousands of feet. On 27th, favoured again by cloudy weather, we were able to negotiate two broad fords in safety, and also to cross the Tugra Su, a left-bank tributary. The last is a boulder-strewn unpleasant looking place and must be a dangerous crossing if there is much water.

In the road report which A.H.Q. had provided for us we read that on our next day's march, 28th, at one place "there is a bad rocky corner where the track runs along a narrow causeway of rock in about 18 inches of water with the main channel of the river beyond." Before we reached this place the river had risen in good earnest—a chocolate-coloured flood boiling and spouting over the boulders. We found the causeway under a good three feet of water and quite impassable for laden animals. The flood was obviously rising and might last for days. There was no other road. Above the causeway a rock face gave good hand and foot holds and it was decided to go on if possible. All the baggage was off-loaded and half the party climbed onto the cliff. Perched wherever we could stand firmly we passed everything across to a small beach on the other side, slinging the heavier things on ropes. The ponies were led, two at a time, through the water over the causeway, the second of each pair being tied to the leader's tail. One man shoved the ponies off and a long rope, fastened in turn to each leader's head collar was passed across the line of men balanced on the cliff. All the ponies were off their feet at one place, the wretched mokes almost all the way. Had any of them been swept off the causeway we could not have held them in the torrent beyond. The current over the flooded track helped us by driving the frightened animals close in under the cliff. From shore to shore the distance was less than 50 yards. It took us 2½ hours to cross. The men worked splendidly, Wandus as usual much to the fore. Some bruises and a cut fetlock were the only casualties. We had no more water to negotiate that day and were thankful. Leaving the flooded Karakash River we turned up a side nala, past some cave dwellings, climbing, between immense cliffs, up a track which is scarcely ever reached by the direct rays of the sun. High up this nala the caravan

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rested on 29th. Two Kirghiz had been sent ahead from Suget to bring yaks from the grazing grounds beyond the Sanju Dawan to take our baggage over since the pass is too steep for laden ponies. The shikar party spent 29th climbing 3000 feet odd and down again to look for a reputed herd of ibex. Small burhel only were found and one of these was shot for the pot. On 30th, the yaks having arrived, we crossed the Sanju—a razorback unfortunately wrapped that day in cloud, or the view should have been magnificent. After descending 2000 feet on the north side we saw below us for the first time a big Kirghiz encampment. Their tents, called "yurts," scattered on rolling grass-land and all about them great herds of sheep and cattle.

The Kirghiz welcomed us most charmingly and an old greybeard made a long speech in Turki to which I replied in Urdu—neither understanding a word of what the other said but both being none the less satisfied that eternal friendship had been offered and accepted. We camped that night amongst them in more peaceful surroundings than we had known since Panimik. From this place, called Jandar, the road to Sanju Bazaar follows the Sanju defile—the river being known as the Sanju or Sarigh-Yar.

Flood being now a serious menace to our progress we were early on the road next day, reaching the junction of the Kichik-Yallak stream by 7.30 a.m. The main stream has to be forded many times owing to the cliffs falling sheer to deep water on alternate banks, but all the crossings were safely negotiated until a mile below the junction of the Gezge stream. Further progress on the left bank being here impossible an attempt was made to cross to the right bank. The river, a torrent 30 yards broad, looked a very ugly proposition. Wandus, Ghulam Hassan and Yasim Beg plunged in. All three were swept off their feet, Yasim Beg disappearing completely for a few seconds. They scrambled out laughing, nothing daunted from their ducking in the icy water and tried another place farther up with much the same result. A Kirghiz who had managed to find a way across the cliffs from lower down told us that many caravans were held up by the floods—but that he had passed a party of 8 camels only a mile below us carrying charash to Suget. Soon after this the camels appeared moving up the right bank and waded without difficulty through the heavy water where we had

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tried to cross. After prolonged and at times acrimonious bargaining the head camel-driver was persuaded to take our baggage as far as the branch nala leading to the small Chuchu Pass for ten rupees and a packet of cigarettes. Our baggage was then transferred to the camels which made the first crossing without difficulty. But the river had been rising very rapidly and a precious hour had been wasted in coming to terms with the camel driver. As a result we found that the next ford down which the camels had crossed easily a few hours before presented now a serious obstacle. The water reached the camels' bellies and it needed much pulling and pushing to make them go through. One got his legs mixed up with a big rock, fell over and was with difficulty put right side up again. Its load, of course, was drenched. The ponies, as at the previous ford, floundered through unladen, the men holding to their tails or riding the stronger ones. Most of us were well soaked on reaching the left bank, and any thought of crossing the next ford, only half a mile below, had to be abandoned. We were now unable to move up or down the valley and spent that night and all next day in a camp at the water's edge. Fortunately some bushes provided us with fuel and a little grazing was found for the ponies. By evening of August 1st the flood was clearly subsiding and we were able to cross all the fords on 2nd without difficulty. At the junction of the valley leading to Chuchu Dawan loads were transferred again to the ponies and, camping for one night under the low pass, we came at last, on August 3rd, to the pretty little village of Kizil Aghil. A boy ran out to meet us carrying a basket of fruit and we were then welcomed with the whole-hearted cordiality which awaited us wherever we went afterwards in Sinkiang. We had crossed the whole mountain barrier, and before us lay the last low spurs of the Kuen Lun foothills.

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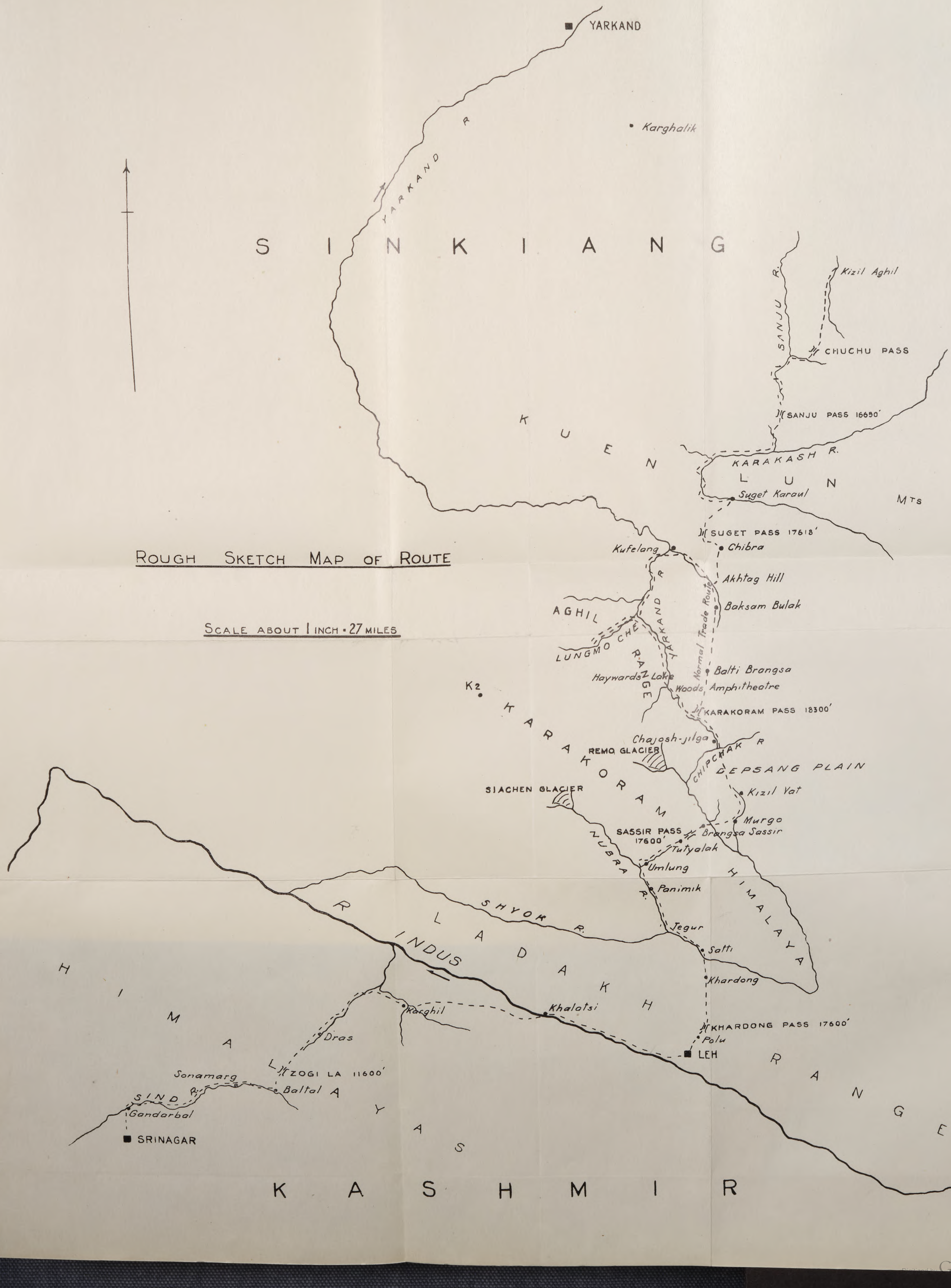
ROUGH SKETCH MAP OF ROUTE

SCALE ABOUT 1 INCH = 27 MILES



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RACING IN INDIA.

By Major F. H. Richards, d.s.o., R.A.

WHEN the Secretary of the R.A. Institution asked me to run out a short article for the Journal on this subject, my first inclination was to decline, as there are so many people far more capable of tackling it. This inclination was only overcome by his final words, which were: "You might possibly temper the wind to the shorn lamb for some 'chasing R.A. subaltern ordered to India, by putting it into his head to collect a plater to take out." Anyhow this is my main object in writing what follows.

Well, then, there are two main branches of racing in India, i.e. racing under rules, and gymkhanas. As regards the former, it is operated by two clubs, viz.: the Royal Calcutta Turf Club, which controls the north and east, and the Western India Turf Club which controls the west. The Western India Turf Club I shall not discuss, as nowadays there are neither jump races nor welter flat races at meetings held under their rules, so the amateur gets no riding. Further, there are practically no R.A. stations in this area. For similar reasons I shall not refer to meetings held at Calcutta, Madras, Bangalore, etc., under Royal Calcutta Turf Club Rules, but shall confine myself to their "Up Country" programme.

The "Up Country" season, then, provides the following meetings as a rule:—

Early November—Meerut Autumn Meeting	...	3 days.
Mid-November—Lucknow Autumn Meeting	...	3 ,,
End December—Lahore Christmas Meeting	...	4 ,,
Early January—Rawalpindi Winter Meeting	...	3 ,,
Mid-January—Ambala Winter Meeting	...	2 ,,
Early February—Lucknow Spring Meeting	...	3 ,,
End February—Meerut Spring Meeting	...	3 ,,
Mid-March—Lahore Spring Meeting ...	...	2 ,,
End March—Rawalpindi Spring Meeting	...	3 ,,
Early April—Peshawar Spring Meeting	...	2 ,,

These are all R.A. stations, and fairly convenient to each other by train, so there is plenty of racing for you if you can manage to get the necessary leave.

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Next, as regards the types of horses running, there are English, Australian, and country-bred horses, and English, Australian, country-bred, and Arab ponies. The difference in form between these various animals is so great that classification is resorted to, i.e. the best animals are put into Class I, the next best into Class II, the next best into Class III, and the remainder into Class IV. This classification is carried out by the Royal Calcutta Turf Club. As nothing but the better English and Australian, and the best country-breds, ever get beyond Class IV, the fastest and slowest of this class are a long way apart. In fact it is usual to have separate races for the various breeds and sizes in it. Thus an average "Up Country" three days meeting might include 3 jump races (any class or breed), 3 handicaps for horses in Classes III and IV, 3 handicaps for country-breds in Class IV, 2 handicaps for ponies in Class IV, 2 handicaps for Arabs, and one or two welter handicaps for horses in Class IV belonging to officers.

As regards weights, these generally run from 9 st. to 12 st. 7 lbs. in jump races, from 9 st. to 11 st. 12 lbs. in welter handicaps, and from 7 st. to 9st. 12 lbs. in other races. In fact, it is the jump races and welter handicaps in which the amateur rider is chiefly interested.

The value of these is generally about Rs2000 (i.e. £150), of which the winner gets Rs1500, the second Rs300, and the third Rs200. In fact it pays to run into a place out here! The Indian Grand Military Steeplechase, and the Army Cup (a welter handicap flat race over 7 furlongs) are worth about three times the above figures, so are naturally the chief ambition of the racing soldier. Entry fees in India are about the same as they are at home, but trainers' charges are considerably less, being only about Rs140 a month. Travelling expenses are less too, as though one horse costs 4d. a mile on the railway, other horses in the same box only cost 1d. a mile each. In fact six horses travel for 9d. a mile, or 1½d. a mile each. One way and another a horse just about pays his expenses for the cold weather if he wins one race.

The problem then is to get hold of the right sort of horse for the job. It is of course possible to pick one up out here, but the difficulty is to strike the happy medium between the too good and the too bad. A horse that has won a race or two is not only

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expensive to buy, but is also, *ipso facto*, exposed, and will thus be well up in the handicap. On the other hand a maiden is generally a maiden because he is not fast enough to win races! There are not many untried horses knocking about in India.

In fact the best proposition, I am sure, is to bring a young horse out from home. The expense of course is fairly heavy. For instance the cost of taking a horse from Aldershot to Meerut is about £100, the items being as follows:—

	£
Insurance for journey and one month after ...	5
Fare of horse from Aldershot to Birkenhead ...	4
Return fare of man	2
Livery costs at Birkenhead	3
Malleining by vet before embarkation	1
Fare of horse by Anchor Line to Bombay ...	40
Forage, etc., on board	7
Gratuity to first officer	5
Landing expenses and livery at Bombay ~~Rs~~90 or (N.B.—Messrs. Crawford, Bellasis Road, Byculla, Bombay, will undertake landing, livery, and despatch up country.)	7
Fare of horse from Bombay to Meerut ~~Rs~~250 or	19
Certificate of identity (must be obtained from Messrs. Weatherby before the horse sails, and sent to the Royal Calcutta Turf Club after he lands, so that he may be registered and classified under their rules)	2
Veterinary examinations, required by certificate ...	2
Royal Calcutta Turf Club charges for registration and classification	3

In view of these unavoidable expenses it is obviously not a good proposition to bring out a £25 screw. On the other hand, even if you can afford it, I am sure it is a mistake to bring out too good a horse. He will only be put into Class III straight away and thus be debarred from running in welter handicaps. Incidentally he will get a prohibitive weight in jump races. The happy medium is a horse of the class of the average plater one sees running under National Hunt rules all the winter at home, price £150 to £200. He should be young, say four or five years old, and must have

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good legs and feet in view of the hard going. The fences up country are a bit smaller than the fences at home, so a hurdler at home will generally make a 'chaser out here, and a little horse does better than a big one. If you buy a mare you will always have a market for her, as she will be in demand for breeding purposes. The main thing, however, is to get one with a docile temperament, who will always eat his corn, and whom neither the journey, nor the novel conditions in the East, will upset.

My own experiences will interest no one, and I only give them to encourage those who may still be hesitating over the proposition of bringing a horse out to India. I was home on leave in 1925 and bought a 4-year-old selling hurdler called "One Guinea" for £180. I had to keep him at home for a few weeks before embarking him, so my total expenses before I unboxed him at Roorkee (where I was then stationed) came to £120. In fact I was £300 out of pocket before I ran him out here. However, in 1926 and 1927 he won me three hurdle races, three welter handicaps, and three open handicaps, worth in all about ₹13,000, or £1000. Incidentally he was unluckily beaten a neck in the Army Cup, the winning of which would have brought in another £300 odd. Training, travelling and entry expenses cost £300, so I cleared £700, and finally sold him for the £300 he had cost me before he ran out here.

This may be an exceptionally lucky example, but I am sure there are many young platers to be picked up at home to-day, who would do likewise if they were given the chance.

So much for racing under rules up country, and I will conclude with a few words about Gymkhanas. These are held fairly regularly at most military stations in India, and every type of animal is catered for. The difference in form between the various animals running is even greater than it is at the regular meetings, so "Distance handicaps" are often included in the programmes. In these the owner declares at entry the weight his horse will carry, and this factor is considered *pari passu* with his form by the handicapper, who then allots each animal so many yards' start from scratch.

The prize to the winner is not allowed to exceed ₹99, so of course no one would dream of importing a horse for the sole object of winning Gymkhanas. The fact remains that a horse

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imported for regular racing gets many opportunities of running at Gymkhanas in the intervals between the more serious events, and this adds considerably to the fun that one may expect to get out of him. Putting aside the imported English or Australian horse, there are many useful country-breds to be picked up nowadays, who will certainly pay for their keep by winning a Gymkhana race or two.

On the whole, the keen racing subaltern ordered out to India need have no cause for alarm. If he brings out a plater, and picks up a useful country-bred as soon as he knows his way about out here, he will probably find that he can get more fun for his money than he was able to do at home.

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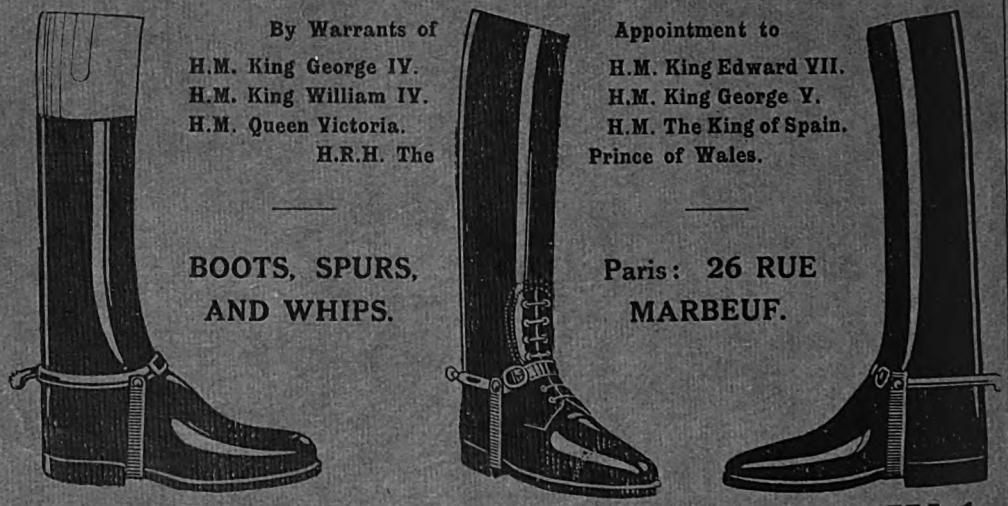

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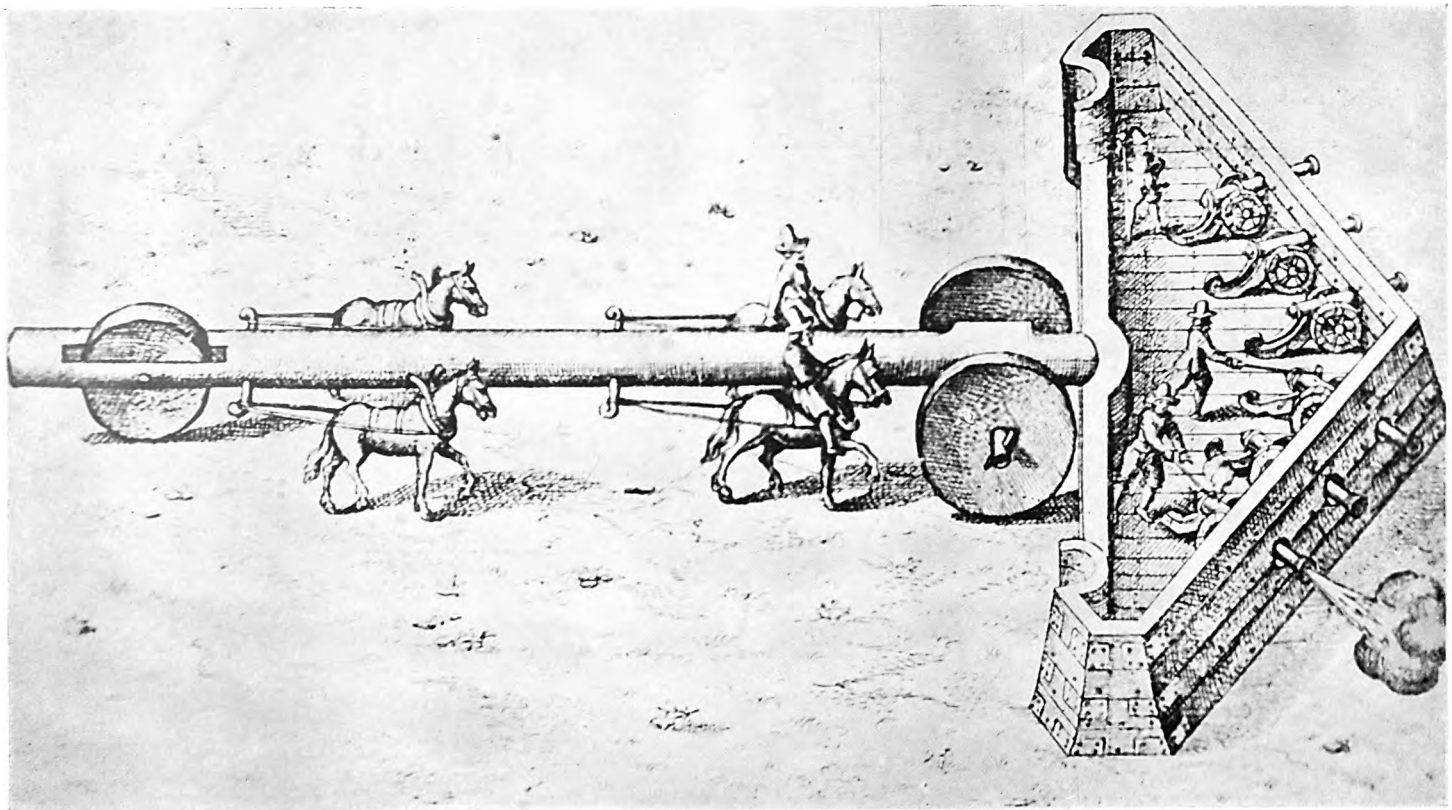

From a print of that date.]

A "Tank" idea of 1617.

[*See p. 143.*

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"DUNCAN" GOLD MEDAL ESSAY, 1928-1929.

"What changes in training and equipment are necessary to enable artillery in the field to counter armoured fighting vehicles successfully."

BY MAJOR G. E. A. GRANET, D.S.O., M.C., R.A.

"CORRECT THE PAST. RULE THE PRESENT. SEE TO THE FUTURE."

INTRODUCTION.

THE Railway, the Aeroplane, the Submarine and every other invention of public interest has had, in its early years, to struggle for general recognition of its value. Soldiers, for all their reputation, are not the only "Diehards," ready to oppose, tooth and nail, anything new which they do not understand and which, very often, they have not taken the trouble to study. The inventor and his friends, in order to obtain a hearing, are often forced, even against their own inclination, to put forward extravagant and sensational claims; and the opposition, exasperated at such palpable futility, vehemently refuses to allow that the new invention can have any merits whatever.

So it is with tanks. The controversy, which is now happily dying down, has been almost bitter, and false deductions have been made and misquotations bandied about in a way that reminds one sometimes of little boys at a private school. Both sides take as an instance in support of their theories the battle of the 8th of August, 1918. The tank advocates quote it as the outstanding example of what admittedly imperfect tanks can do, omitting, however, to be fair to the other arms, whose support made these achievements possible. The other side, on the contrary, stresses the tremendous weight of artillery employed, the poor organisation of the German position and the low level of the *moral* of their troops. It seems that they would have us believe that the battle would have been as easily won, and with as few casualties, had there been no tanks on the British side at all. It is not difficult on the one hand, to point to the many imperfections of the new weapon in order to belittle its possibilities, nor, on the other, to exaggerate its merits by instancing performances achieved under specially favourable

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conditions. Both faults are to be avoided if any useful conclusion is to be arrived at. Credit must be given to both sides, the attack and the defence, for making the best use of the means available, while as regards material, a fair and reasonable appreciation is required of the effect of normal progress in the next few years.

Tank design is still in its infancy and has not yet settled down and become stabilised. We are still in the period of experiment and research in which there is scope for such new ideas as revolutionised battleship design on the appearance of the first "Dreadnought." In the consideration of counter-measures, then, it behoves us to look well ahead, so that we may get as long a start as we can in this new race of "Armour and Speed v. Gun."

Armoured Fighting Vehicles.

It is the combination of armour and speed that enables the A.F.V., immune from the effect of small arm fire, to close with its enemy. At the beginning there was only one type, but since then different types have been produced according to the work for which they are required. Some are fast, lightly protected and lightly armed. Others are slower and carry a more powerful gun.

Now protection by speed and protection by armour are mutually antagonistic and the amount of armour that a vehicle can carry is limited, among other things, by the power of its engines to drive the weight at a given maximum speed. And this speed is itself limited by the strength of the chassis and tracks and by consideration of the comfort of the crew. At the moment, the limit of weight of armour gives protection against ordinary small arm fire, but not against special A.P. bullets of larger calibre. It is, however, reasonable to assume that, in the not too distant future, there will be such progress in metallurgy and in the design of engines, both of the petrol type, and, as in the case of the new German cruiser, of the crude oil type, as will enable armoured fighting vehicles, of the heavier types, to withstand the fire of the largest gun that can properly be called an infantry weapon.

Not all A.F.V. will be thus heavily armoured. Reconnaissance vehicles needing speed and a large circuit of action will have to be lightly armoured and so will not be proof against infantry anti-tank guns.

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"At close quarters," says Tank Training, Vol. II, "the action of armoured fighting vehicles will normally be decisive." This close quarter work is the rôle of the heavy tanks and it will be the duty of the artillery of the defence to stop them before they get to close quarters.

Armoured Fighting Vehicles in Action.

In his Foreword to "The Mechanization of War," Sir Frederick Maurice writes: "If there is one lesson with regard to the tank, which the war teaches us more clearly than others, it is its dependence for effect upon the aid of other arms, its vulnerability when employed without such aid." The problem, then, which confronts the artillery of the defence, is that of countering, not only the armoured fighting vehicles themselves, but these vehicles supported by the full weight of the other arms. The forms which this support will take include counter-battery fire, smoke screens on gun and machine-gun areas and on likely O.P's with attacks from the air by bombing and by machine-gun fire from low-flying planes.

All improvements in the range and power of firearms have the effect of enlarging the area of the battlefield with the result that battles take longer to decide and the increases in the fire power of the defence call for ever greater increases of fire by the attack. Armoured fighting vehicles will, it is expected, by their speed reduce the size of the battlefield and, by virtue of their armour, be able to dispense with part of the tremendous amount of supporting fire which is vital to the unarmoured infantryman.

Prior to an attack by A.F.V. the first requisite is a thorough reconnaissance of the ground over which they will have to move. "Ground to give cover and to facilitate movement . . . . is the primary consideration." (Tank Training, Vol. II.) It is possible that a wrong impression as to the most suitable ground for A.F.V. to operate on has been derived from the fact that the Armoured Force was trained on Salisbury Plain. Open down land is not the best, for it gives no cover and exposes the attack to artillery fire. This point is well brought out in War Office Exercise No. 4 of 1928. The tank battalions are launched against the more covered portion of the enemy's position. Small woods and copses, hedges, corn standing or in stooks and allotments combined with the natural

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undulations of the ground will assist the tanks to keep out of view except at intervals and for short spaces of time. Rabbits in the open are an easy target. It's a different matter when they dart across a narrow ride. Of course, hedges won't stop bullets, but they may burst the shell or turn them, as many a shikhari has found after missing an apparent "sitter."

The section of tanks is the smallest tactical unit. It is also the largest unit within which some degree of control can be maintained when the vehicles are closed down. As means of intercommunication improve, the position in this respect will alter, so that it will be possible to control the movements of companies and battalions during the actual progress of the fight. Then the tank will be really formidable, and more so when better powers of vision enable it to make full use of the ground. At long ranges, over 1000 yards, the advance is covered by the fire of other weapons and the tanks, if fired at, avoid casualties by manœuvring and by frequent changes of speed and direction. At close ranges, under 400 yards, they attack the anti-tank weapons themselves, covered mainly by their own fire and by that of any infantry who may be available. The idea of A.F.V. moving in close physical contact with the troops with whom they are co-operating is out of date. The method of attack is shown in Sketch I. Three tanks attack from one side while the fourth is sent round to the flank or rear. The theory is that guns cannot be traversed quickly enough to keep continuous fire on a tank crossing the front at short range. The best time for attack, provided that the ground admits of it, is dawn, though attacks at dusk or at night are not precluded. In the event of the attack being successful, A.F.V. are pushed through to attack rear organisations, headquarters, advanced aerodromes and so forth. An army on the move and its lines of communication are also liable to attack by the faster moving types of A.F.V. So much, then, for a brief explanation of the problem confronting an army whose enemy is equipped with armoured fighting vehicles.

Anti-Tank Defence.

The principles of defence against A.F.V. are the same as against any other arm. Concealment and surprise, use of obstacles to canalise the attack, depth and room to manœuvre as well as facilities

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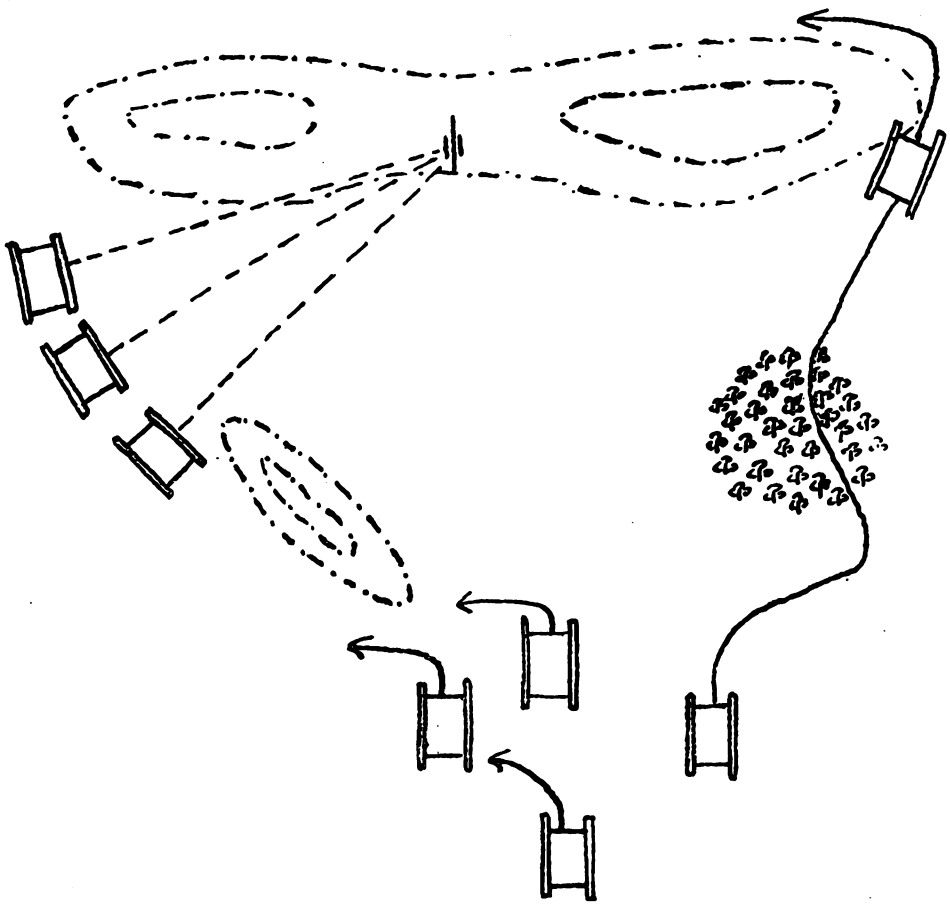
SKETCH 1. AN ATTACK BY TANKS.



for counter-attack all have to be considered. From the point of view of artillery in the field, attacks on transport and lines of communication must be left to other means of defence to deal with, for the amount of artillery available is limited and cannot be scattered up and down back areas to meet attacks that can be equally well dealt with by heavy machine guns or anti-aircraft guns. The main consideration is how to counter armoured fighting vehicles in battle.

The two chief weapons for doing so are tanks and artillery. Tank Training is very definite on this. To quote once more:—"It is at all times the duty of a tank unit commander to divert as much of his command as possible to meet an unforeseen tank

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counter-attack . . . . In consequence, infantry may find themselves deprived of tank support at a critical moment." Hence it appears that even the threat of a tank counter-attack may be sufficient to relieve pressure. These counter-attacks must be supported by artillery, just as anti-aircraft artillery is used to break up the enemy's formations in the air and to throw their arrangements for mutual support out of gear. With regard to artillery, Tank Training lays down:—"In all circumstances, the primary duty of supporting artillery is the protection of A.F.V. from observed fire." It is suggested that the best method of doing this will often be a liberal use of smoke shell.

So far no one has been able to devise a means of seeing through a smoke cloud and if the cloud is successful in blinding the guns and their O.P's it would seem that the only thing to do is to put down a barrage on likely lines of approach. It is a miserable substitute for observed fire and it is hard to feel any great confidence in it, but it is said to answer in the case of aircraft, and their liberty of movement is even less restricted than that of A.F.V. The success of a barrage will depend on the extent to which it has been possible by the use of obstacles to restrict the attack to certain avenues of approach. It may be, however, that O.P's are not all blinded. In this case the attack can be engaged with indirect fire, provided always that communications hold and that the B.C. is skilful enough to take on one of the most difficult of all targets. The latter is a matter of natural ability perfected by training and will be discussed later. The question of communication will, it is hoped, be satisfactorily answered by radio telephony. But whether the smoke screen is effective or not, there comes a time when the tanks have to come through the screen and attack the infantry positions and the forward anti-tank guns. Then it becomes a case of each gun for itself and direct laying at moving targets coming from two directions at once with an angle between them of anything up to 180°. But the guns in rear will also be able to cover this forward area and will assist, probably with indirect fire.

Smoke, however, is a two-edged weapon. It blinds the tank as much as it blinds the gun. There is, therefore, every chance that the gunners will be able to see the tank emerging from the smoke before they are themselves seen, for a moving object is more

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conspicuous than a stationary one and a tank is a larger object than a gun. Another way in which the attacking artillery supports its tanks, is by counter-battery fire. A successful attack demands superiority of fire, or, in other words, that the artillery of the defence shall be effectively neutralised. The basis of counter-battery work is artillery intelligence. The hostile intelligence service can be deceived and misled by well-concealed positions, mostly silent, by the use of dummy positions and "roving" guns, which, with effective anti-aircraft defence, may prevent the collection of reliable information for a considerable time—more time than is likely to be at the disposal of a commander in mobile warfare—so that he may be forced to launch his attack under less favourable conditions than he would wish.

Low-flying attacks by S.S. fighters and bombing are another form of counter-battery work. Aeroplanes have difficulty in finding their targets until the guns begin to fire, which will often be too late. These attacks will be met by the Lewis guns of the batteries strengthened by the Lewis guns of the A.A. brigades, while the bombers are kept at a respectful height by other guns of the defending artillery or by A.A. guns brought up for the purpose. The above is an outline of the ways in which the support to a tank attack can be countered. We can now consider what is wanted to deal with the vehicles themselves.

Artillery Equipment.

A fault, to which the British soldier is rather inclined, is that of underrating his enemy. As far as tanks are concerned, let there be no mistake about it. Properly handled and supported and capable of making full use of the ground, they will not be easy to stop. Targets for the guns will be of a fleeting nature, moving comparatively fast from widely different directions. Besides there is always the fear of a surprise attack on a flank or from the rear. Whatever guns are detailed to meet these attacks, whether specially armed units or batteries of the divisional artillery, the first thing that a commander wants is a mobile reserve. This is not to say that these guns are to be kept out of the fight till needed, but that their fire must be superimposed on that of other batteries, so that, if they have to be withdrawn, there will be no gaps left. Previous reconnaissance of routes and positions goes without saying.

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Mobility is the main factor. Speed over the ground and quickness into action are essential. There will be no time for laying platforms for the gun to fire from. It must fire from its travelling carriage. Is it to be tractor-drawn or self-propelled?

The tractor-drawn carriage gives a better distribution of weight over soft ground. It can be made smaller than if an engine has to be incorporated in it and therefore gives a smaller target in action. Also, the tractor is not so exposed to the risk of damage and, if the gun is destroyed or has to be abandoned, the tractor is still available. What protection is needed for the detachment? Putting aside the question of counter-battery fire, the gun may be under infantry fire from its original front at the same time as it is shooting at a tank coming in on its flank or at one that has already broken through. So it would be desirable to have all-round shields if it were not for the weight entailed. This is a point that must be left till other requirements have been fulfilled. The designer can then give as much protection as he can afford within the limits of weight imposed. The more the armour, the less the mobility and, perhaps the less the shell power of the gun.

Now, what shell power is wanted? It is said that the 18 pr. is too powerful. That it is like taking a sledge hammer to drive a tack. Certainly, the idea of a nice, light, handy little 3 pr. or 6 pr. is most attractive, but it means another special gun with complications in manufacture, training and in ammunition supply. It is a mistake to train artillery for one rôle only, and that a defensive one, if it can be avoided. It has had to be done in the case of anti-aircraft, but that is not a reason for continuing the process.

And where are these special units to come from? Is the divisional artillery to be decreased? It is said to be too small already to cope with the increased fire power of the defence. Can we give up some medium or heavy guns? The Germans taught us their value at the beginning of the war, and we cannot afford to weaken our main counter-battery artillery. No howitzer is a thoroughly satisfactory anti-tank gun on account of its curved trajectory, low muzzle velocity and slow rate of fire. The light batteries are wanted for close support, particularly in country which is unsuitable for the other close support weapon, the tank. So we cannot give them up.

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We could, of course, increase the establishment of the Royal Artillery at the expense of some other arm, but we should at once come up against the Cardwell system; and there are many situations in war and many places in the Empire, where man power is more needed than gun power. We must just make the best of what we have got and use the gun batteries of the divisional artillery. and it won't be such a bad test either if they get a good gun. It will save a lot of complications. Any brigade will be able to push forward sections or single guns to give the infantry moral as well as material support, while the remainder, disposed in depth behind, will carry out their ordinary tasks and, unhampered by smoke, will be ready to deal with any tanks that succeed in breaking through. The complete mechanisation of the divisional artillery is in prospect, so that the mobile reserve will be at hand to meet attacks from unexpected directions or to support a counter attack by our own tanks. These might well be the tasks of the Army Brigade if one is present, thus leaving the divisional artillery to work with its own infantry, which knows and trusts it. The result is that instead of one battery or one brigade of anti-tank guns in a Division, there will be nine batteries without counting the field and light howitzers, whose fire is not altogether to be despised.

Assuming agreement with the argument given above, we now come to review the special qualities which these guns will need to enable them effectively to engage armoured fighting vehicles. Their special prey will be the heavily armoured tanks, which may be proof against the infantry's heavy machine guns. So we return to the question of shell power. We have now got the most powerful field gun in Europe, a gun, moreover, which has thoroughly established its reputation in war. It would be wrong to give up any of this advantage unless it was absolutely unavoidable. No one but a fool goes after dangerous game with a light rifle. He wants all the stopping power he can get and he takes the heaviest rifle that he can buy and use. As anti-T.B.D. guns, the 3 pr. and 6 pr. are out of date and the secondary armament of battleships is now 4·7″ and 6″ guns. These guns have the stopping power and that is what is wanted against tanks. A shell that will stop a tank with one hit on any part of it, and for this the 18 pr. is not too heavy.

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The second essential is handiness. The tactics of tanks at close quarters call for very rapid switches through big angles and for the shortest possible interval between rounds. It is real snapshooting at moving targets, perhaps imperfectly seen on the other side of a hedge or with nothing but a turret appearing over a crest. This demands an all-round traverse, which can be thrown out of gear for the gun to be swung on to the target, while the gear itself must be quick and smooth to allow the layer to keep on a tank which is crossing his front 400 yards away at a speed of perhaps 15 miles an hour. This works out at a switch of over one degree a second. Quick shooting means quick loading, so semi-automatic loading is desirable. It may not show any great advantage over a really first-class detachment, but one must legislate for the average or even the inferior. It will be as well to have independent line of sight so that changes of range will not throw the layer off the target. But with a gun of high muzzle velocity the trajectory will be practically flat and changes of range should not be necessary. Therefore in the interests of weight reduction, the elimination of the extra gear may be advisable.

What is really essential is that the layer should be able to keep his sights on the target at all times. Changes of range and deflection should be put on by one of the other numbers, since even a clicking gear gives him something else to think about. The layer, warned by a tap on the shoulder that all is ready, should also fire the gun. This, since his hands are busy with the gears, he can do with his foot. The gun outlined above approximates closely to an anti-aircraft gun, which is another point in its favour, for artillery in the field will, in future, be called upon more and more to assist in aircraft defence. The real difference between the two guns is that the field gun is not capable of such high-angle fire. Breech trunnions would allow this to be included, otherwise the gun would be hard to conceal. The A.A. gun only fires a 16 lb. shell and it is suggested that the two guns should be brought into line to achieve simplicity in manufacture and supply of ammunition. Whether the new field gun should be a 16 pr. or the A.A. gun an 18 pr. is a matter which is outside the scope of this essay. But one does not want to reduce the shell power of the field gun.

The engagement of moving targets by indirect fire was men-

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tioned earlier. Reliability and speed of communications are the things to aim at here. The "dead time" must be cut down to the minimum and to do this the conditions of "voice control" must be established as far as possible. The obvious answer is radio telephones, with which some batteries are now being equipped. Every time an order has to be repeated means loss of time. The battery commander should speak directly into the instrument and his orders should be reproduced by a loud-speaker at the command post so that the whole battery can receive them simultaneously. Pending the issue of radio telephones to all batteries, the same system of direct communication could be employed with ordinary telephones.

TRAINING.

An anti-tank gun is rather like a revolver. You don't want it very often, but when you do, you want it "mighty quick." And you can't afford to miss. Tanks present the most difficult targets that artillery are called upon to engage. Rapidity and accuracy are essential, but more than this is needed. Coolness under fire is one of the chief constituents of discipline. It is born of confidence in our ability to defeat the enemy, of the knowledge that we are the better men. General Foy once said of us:—"The Artillery holds the first rank in the Army. The Gunners are distinguished from other soldiers by their excellent spirit." Let us hold to that. But we must work for it.

Good, quick gun drill depends on the proper apportioning of duties among the various members of the detachment. For shooting direct there are two divergencies from the normal. They are:—The senior N.C.O. controls the fire. We want a name for him. "Gun Captain" or "Gun Commander" would be suitable. Secondly, the layer must have nothing to do but to keep his sights on the target and to fire the gun. Changes of elevation and deflection must be put on by one of the other numbers. Which this is will depend on the lay-out of the various gears. It may be 1, 2 or 4. These two men and the layer are the ones who most need special training.

N.C.O's now get plenty of training on the miniature range, which is all to the good, but they get very little with live shell,

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and we cannot afford to give them more; yet they are the people who have to compete with the most vitally important targets under conditions of the utmost excitement and stress. The Gun Captain needs practice particularly in estimating the correct deflection for different rates of angular movement of the target and in observing the "strike" of his shell, as distinct from the ricochet. This cannot be practised on the miniature range indoors.

The layer's work is comparatively simple. He has merely got to keep his sights on a rapidly moving target and this can be practised on the barrack square. But neither here nor on the miniature range is there the excitement and stimulus of competition. Of course, no peace time practice can give the effect of being shot at, but competitive practices are a good substitute. The infantry realise this and they have tile or plate shooting competitions. Competitive shooting in the artillery has long been done away with, but it might well be re-introduced in a special form for this special purpose. Not with shell, of course; the allotment would not run to it, but there are great possibilities in 0·22″ ammunition.

The apparatus required is simple and cheap. (See Plate I.) Remove the primer from a Q.F. cartridge case and in its place put a steel plug, screw-threaded internally to take 6″ of 0·22″ rifle barrel. This will certainly group to 4″ at 50 yds., which at 100 yds. will be accurate enough to represent the zone of the gun at 1000 yds. The rear end of the barrel is chambered to take the Service 0·22″ rim fire cartridge. Since this cartridge is rim fire, the firing hole bush and firing pin of the gun mechanism will have to be replaced by eccentric ones to suit, and possibly a weaker mainspring will have to be fitted. Six barrels and plugs and one firing hole bush and firing pin per battery should suffice. If not, batteries could borrow from one another. The barrels are first loaded with 0·22″ ammunition and the cartridge cases are then loaded into the gun and then fired. All the motions of gun drill are used and the only thing that is not reproduced is the recoil of the gun.

Preliminary practice on the 30 yds. range should be first grouping and application, as in rifle shooting. Then snapshooting at targets appearing in different places for three seconds, and rapid

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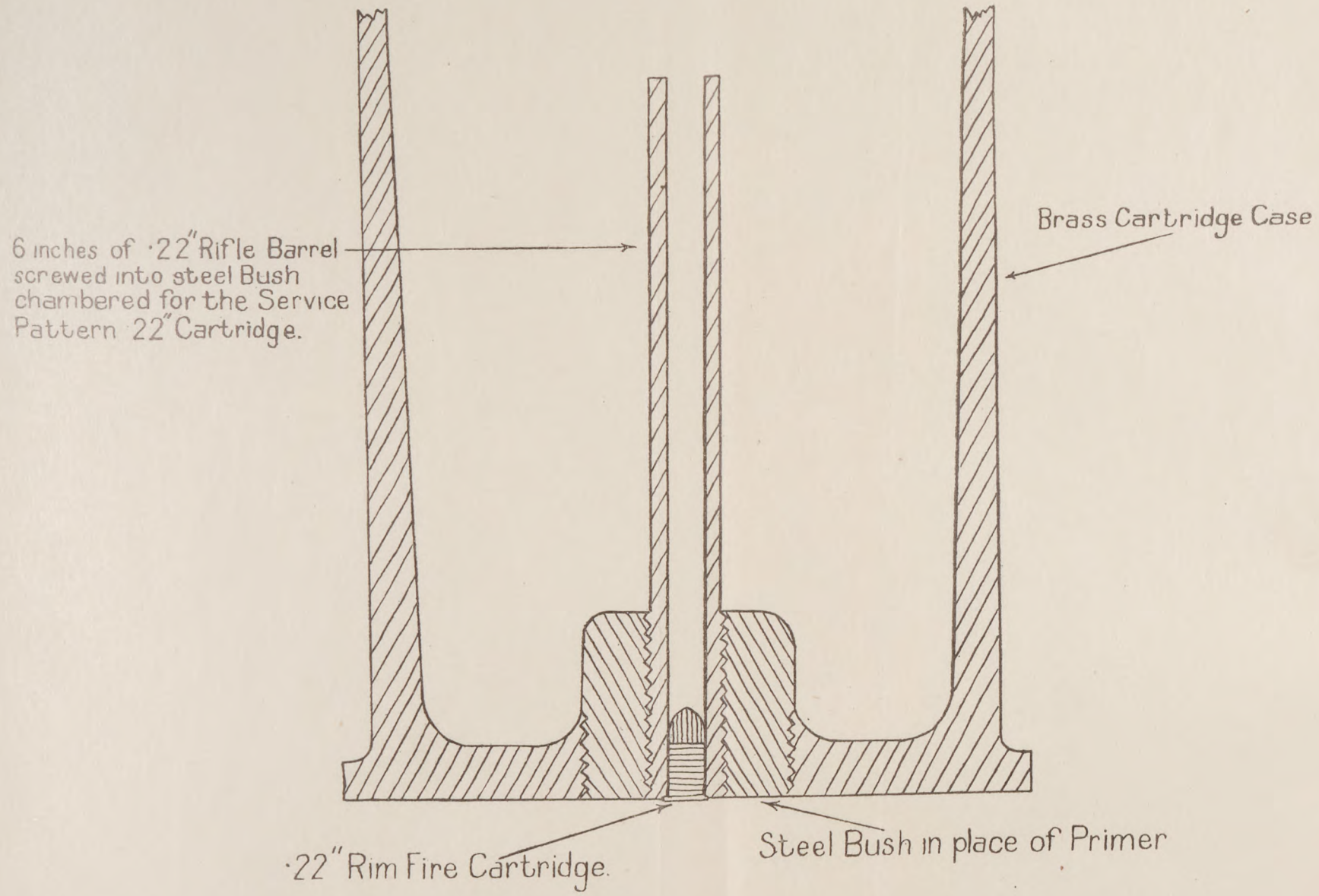
PLATE. 1.


6 inches of ·22" Rifle Barrel screwed into steel Bush chambered for the Service Pattern 22" Cartridge.
Brass Cartridge Case
·22" Rim Fire Cartridge.
Steel Bush in place of Primer

Apparatus for firing ·22" ammunition from any Q.F. Gun or Howitzer.
(Not to scale)

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fire at crossing targets, whose pace, at first slow and constant, would later be varied in the course of the run. The apparatus for this is already in existence on many ranges, and if it is not, it can be very cheaply made by the battery fitter. When a fair proficiency has been attained on the 30 yds. range, the gun will be taken out to the rifle range or other convenient ground and the detachments practised at a model tank drawn over the ground in the same way, in miniature, as tank targets at practice camp. Small banks of earth can be put up to hide changes of direction and to conceal the target except for short periods of time only. There is practically no limit to the difficulties that can be presented to the gunners. About a dozen blocks and a hundred yards of wire should be enough for each run, so it will not be expensive to represent the movements of four tanks in their attack on the gun. Finally, for competition, lay out two identical runs, each of two or more tanks. These tanks will have to be so made as to fall when hit. Firing is carried out simultaneously by two guns and the one which knocks over all its tanks first is the winner.

If the ground is so soft or grassy that the strike of the bullets cannot be seen, it must be admitted that the scheme fails to give practice to the "gun captain," but the remainder of the detachment and especially the layer should get good value from it. Mention has already been made of the possibility of having to engage moving targets with indirect fire. Provided that the ground is suitable for observation, the miniature tank run will give excellent practice in this also. All that is needed is to blind the No. 1 and the layer by hanging a light screen on the gun, so that they cannot cheat by looking at the target. If there are any units of the Royal Tank Corps in the station practice can be obtained in laying at actual vehicles. Officers and N.C.O's of the Royal Tank Corps will, I am sure, be delighted to help by discussing possible methods of attack and by laying out trial runs to test their theories; with consequent advantage to both sides. Lastly, when a battery is sufficiently expert, a demonstration to the infantry will increase their confidence in the ability of the artillery to protect them from their most formidable enemy. If it is objected that all this takes too long, is too complicated and that batteries have not time to give to it, I would answer that nothing is too much trouble if we are to be able to

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carry out our tasks properly and that if a battery can hit a fast-moving, jinking target either direct or from behind cover, it has nothing to fear from any other target that may be presented to it.

CONCLUSION.

It may be thought that undue mention has been made of tanks, to the exclusion of armoured cars. This has been done purposely, for the reason that, in the author's opinion at any rate, the tank is the more formidable of the two. If the heavily armoured tank is produced, this is the type with which, chiefly, artillery will have to deal. Infantry now have, or are in the process of getting an anti-tank weapon of their own capable of piercing the armour of the lighter natures, and it is expected that these guns will carry out protective duties against such vehicles.

The case of defence against an armoured force has not been touched on. The great mobility of such a force gives it tremendous possibilities for surprise and this will ever be its strongest weapon. Its tank battalions will still have to be supported by artillery and small arm fire, but the number of guns available is unlikely to be as great as in the case of an organised attack on a large scale. The case taken for examination in this essay is the one which is believed to be the most difficult for the defence; that is to say when the support to the attack is the most complete that could be desired. An armoured force, if it fails to achieve surprise, will not be in such a favourable position. If our artillery is sufficiently well armed and trained to be able to counter armoured fighting vehicles in the circumstances most suitable to the latter, there should be no fear of their failing to do so when the odds are more in their own favour.

NOTE.—Throughout this essay the following abbreviations occur :—

A.F.V.	Armoured fighting vehicles.
A.P.	Armour piercing.
S.S.	Single seat.
A.A.	Anti-aircraft.
O.P's.	Observation posts.
T.B.D's.	Torpedo boat destroyer's.
B.C.	Battery commander.
Q.F.	Quick firing.

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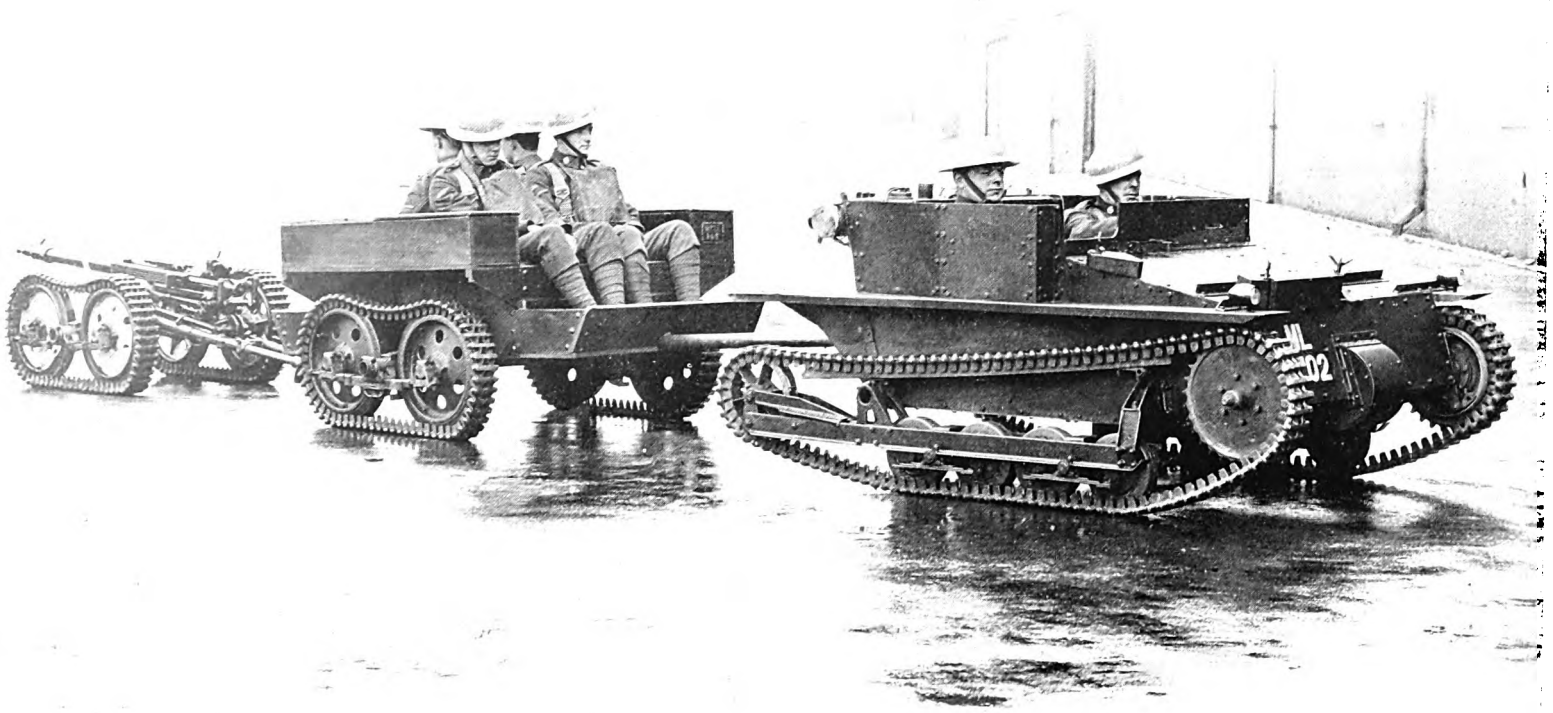

"Anti-Tank Gun, Tractor and Detachment."

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THE EVOLUTION OF ARMOURED FIGHTING VEHICLES.

A Lecture delivered at the Royal Artillery Institution, Tuesday, 19th February, 1929.

By Major-General S. C. Peck, C.B., D.S.O.,
Director of Mechanisation.

Field-Marshal Sir George Milne, G.C.B., G.C.M.G., D.S.O., D.C.L., LL.D., Colonel Commandant R.A., in the Chair.

Chairman: Gentlemen, I do not think I need take up any time in introducing General Peck to you. I am sure you all know him very well.

Major-General Peck: A better title for this lecture would perhaps have been "The Evolution of Armoured Fighting and other Military Mechanised Vehicles." These may be divided roughly into the following types:—

I. *Armoured Fighting Vehicles.*
Those from which the crew can fight their weapons, e.g. Tanks, Armoured Cars.

II. *Armoured Carriers.*
Those which carry into action weapons, which in emergency can be fired from the machines, but are primarily intended to be fired from the ground. The armour is to protect the crew whilst getting into action.

III. *Armoured Tractors*, e.g. Dragons.

IV. *Unarmoured Carriers and Transport Vehicles*—in which no attempt is made to provide protection.

I am afraid that I have set myself a very difficult task:—
(i) because it is a very wide subject to compress into such a short space of time;

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(ii) because I propose to treat it almost entirely from the technical standpoint, and I fully realise that audiences at these lectures are unaccustomed to such treatment; but, at the same time, so convinced am I of the importance of this aspect of mechanisation, that I am determined to try to induce you to "yield to it," as the doctors would say.

It would be a fascinating enquiry to trace the evolution of armoured fighting vehicles from the days of the "testudo," or the "land-ship" (see illustration), up to the present day; but time does not permit me to go further back than three or four, or at most five years. But I hope to be able, in the consideration of even that short period, to awaken a new interest or vivify an already existing one in the present and future development of the mechanised vehicles of the Army. By confining my attention to the consideration of only the last few years, moreover, I escape the necessity of examining the very vexed question as to who invented the tank. We all know the names of those who did such great work in forcing the High Command into experimenting with them and producing them afterwards in large numbers, in face of very great and powerful opposition; but no one knows who actually invented the tank. When Topsy was asked "Do you know who made you?" she replied, "Nobody as I knows on, I spect I growed"; i.e. she was the logical outcome of natural processes. And so it was with the tank; and I am convinced that even if there had been no Great War the tank would have arrived by this time, although presumably under a different name.

As soon as the Holt tractor made its appearance in France, the desirability of constructing a machine with tracks of this type to roll down the wire, an armoured body to protect the driver and a machine gun to take on "the enemy machine guns" was canvassed in several messes to my personal knowledge, and presumably therefore in many others, before anyone in France had the slightest idea that such a machine was actually being strongly advocated by enthusiasts at home. In other words the conditions of modern war had already begun to demand a tank.

I wish to emphasize again at this point that the keynote of my lecture is contained in the word evolution, or, if you like it better, progress of design. The most prominent feature of this develop-

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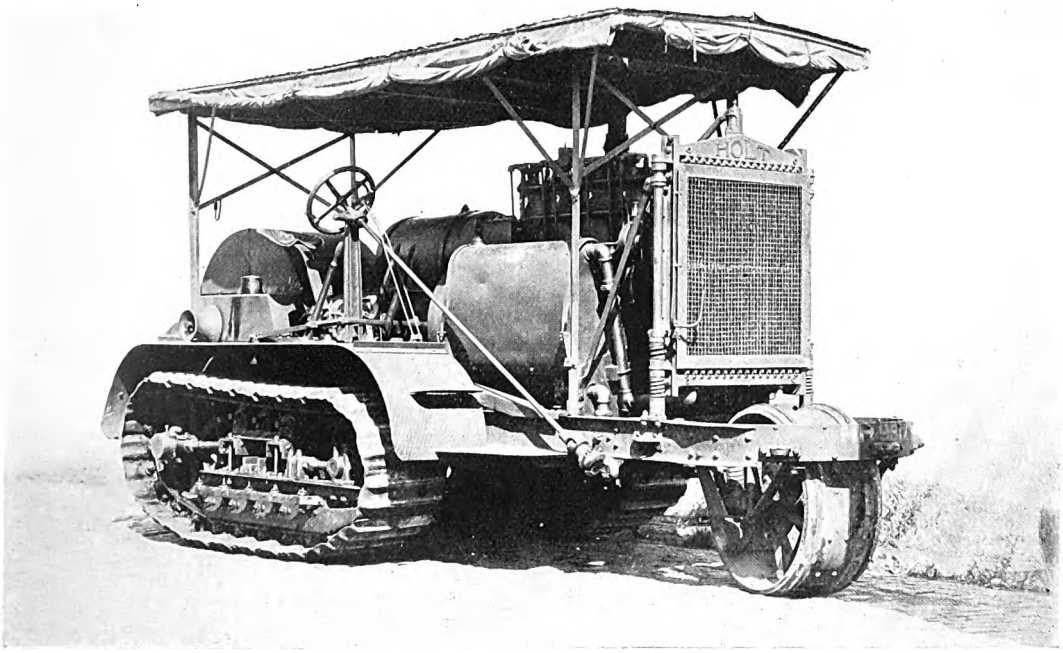
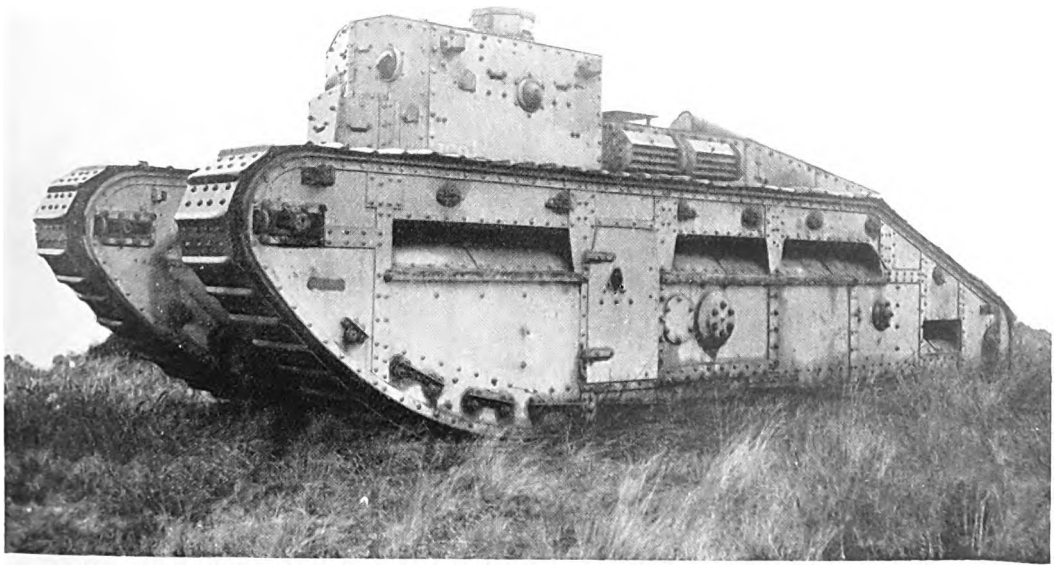


"Holt 10 Ton Tractor—the First Caterpillar Tractor."



"Medium 'C' Tank."

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ment in the tank is the track, and, even at the risk of boring you, I propose to go into the details of the development of the different types of tracks and then show you how they have been employed. I would remind you that at the end of the war the Medium C Tank was just about to go into production. Its characteristics were :—

Weight	...	...	...	20 tons.
Armament	...	...	...	4 Hotchkiss M.G's.
Armour	...	...	...	6—12$^{m/m}$.

The track used was of a very primitive type. It was nothing more than a series of plates joined together by hinge pins. These tracks were laterally rigid so that steering had to be effected by skidding the tracks in contact with the ground. They were not sprung. These tracks had the following disadvantages.

(1) The pins and the bearings wore out very rapidly.
(2) The track plates also wore out.
(3) The sprockets which actuated the tracks only lasted for 50 miles, in the case of the Mark V tank; but improved to 100 miles in the Medium "C."
(4) The life of the track itself was somewhere between 150 and 200 miles, and that at an average speed of not more than 5 to 8 miles per hour, in the case of the Mark V tank; with the medium "C" tank, it improved to something between 250 and 500 miles.

At the end of the war there was an outcry for increased speed and it was quite evident for this reason, and because of its short life, that this type of track and its suspension must be scrapped. Several attempts had been made during the war to spring the tracks but all had proved abortive, and it was not until 1922 that the first satisfactory sprung track was produced and tried on an experimental machine and then on the Medium Tank Mark I.

This tank was the beginning of a new era. The track was of a *built up* type, and it was suspended by bogies actuated by springs enclosed in cases which allowed it to articulate in the vertical plane. Although the springing increased the life very considerably, and there was little or no wear of the sprockets, there was still great room for improvement. The sole plates of the track quickly disintegrated as the rivets wore and dropped out. Moreover, these

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tracks were difficult and expensive to manufacture. The characteristics of this tank were :—

Weight (loaded)	...	$10\frac{1}{2}$ tons.
Engine ...	...	Armstrong Siddeley, air cooled.
Speed ...	...	15 miles per hour.
Armament ...	...	1 3 pr.
		4 Hotchkiss machine guns.
		2 Vickers machine guns.

You may be interested to know that great criticism, one might almost say opprobrium, was heaped on the heads of those responsible for the production of these tanks, on account of their determination to have an air-cooled engine specially designed for this tank. These engines have definitely been a great success, and amongst others possess the following advantages :—

(1) Immunity from the effects of frost. (I have no doubt that many officers present would have been saved a good deal of expense during the recent continuous cold spell if they had had air-cooled engines in their cars.)
(2) High efficiency in hot climates.
(3) Less vulnerability.
(4) They do not require water—a very valuable asset in hot climates.

This tank was followed in 1925 by an improved design, namely, the *Medium Tank Mark II.* It possessed the following advantages, viz :—

(a) Thicker armour but increased weight.
(b) The driver was placed more forward, giving him a better view.
(c) The spring cases were protected.
(d) The track plates were stamped.

The advantages of the stamped plates were :—

(1) They were more easy to manufacture.
(2) They had no rivets on the soles, and therefore showed greatly increased wearing properties.

It can now be said that the plates themselves wear very little, but the pins and sleeves in which they function have to be replaced about every 1000 miles. It is hoped to be able to improve this

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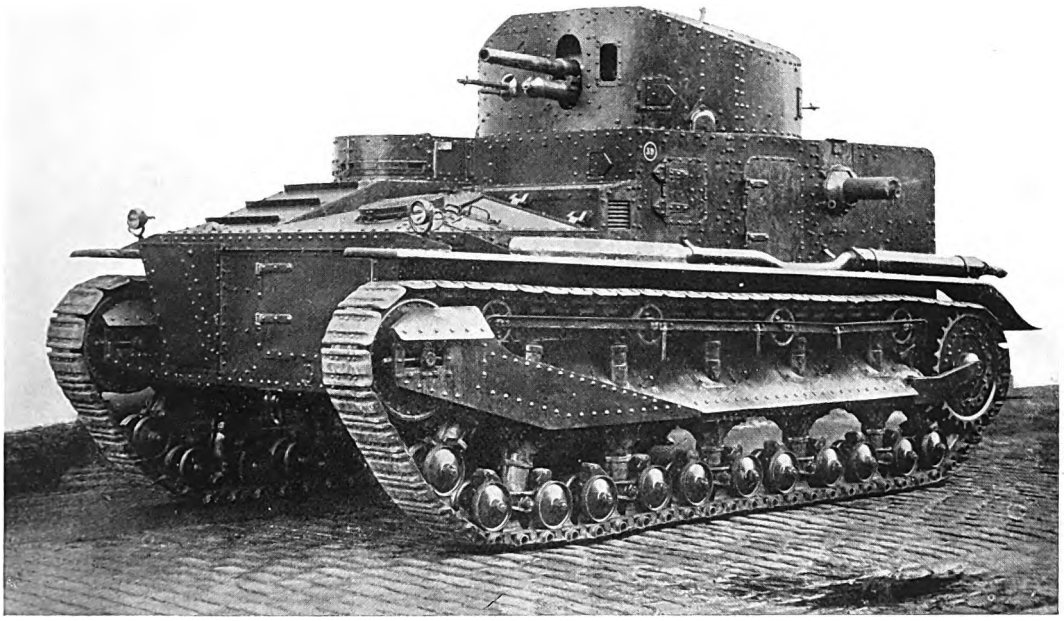
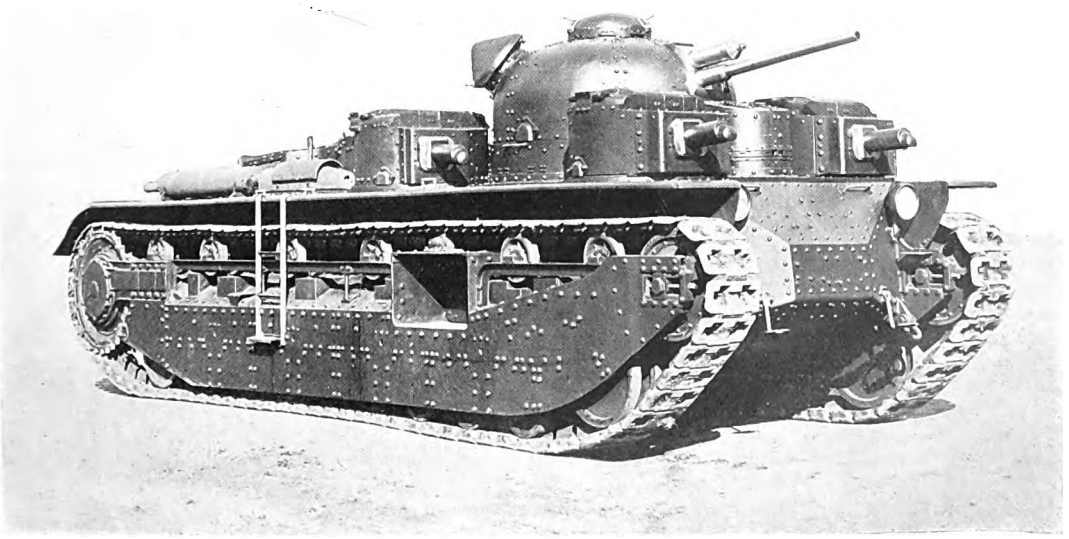


"Medium Tank. Mark I."



"Heavy Tank."

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situation to the point when it can be expected that a life of 3000 miles can be obtained, and this at a speed of about 12 to 18 miles an hour. Remember, IT IS PACE WHICH KILLS with a track as with a horse.

The chief disadvantages of the Medium Tanks, Mark II, were :—

(1) Difficulty of control by the driver. There are four levers in these tanks which need constant manipulation by the driver when going across country, to say nothing of the clutch and accelerating pedals. This leads to early exhaustion of the driver.
(2) The difficulty of vision for drivers, machine-gunners, and tank commanders.
(3) Danger from petrol fire.
(4) The small arc of fire of the Vickers machine guns.
(5) General unsteadiness of the gun platform.
(6) Bad ventilation.

Independent Tank.

In 1924 the General Staff had laid down the following requirements for an "Independent" Tank :—

1. *Armament.*
   1 3 pr.
   2 Vickers.
   1 Automatic for A.A. work.
2. *Speed* : 20 miles per hour.
3. *Radius* of action : 200 miles.
4. *Armour* : as thick as possible.

An attempt was made to compete with these, and the outcome of it was what is known as the Independent Tank. The characteristics of this tank are :—

1. *Fire power* :
   (a) One 3 pr. in turret capable of all-round fire.
   (b) Four Vickers machine guns each in separate turrets—one capable of A.A. fire.

By this arrangement in separate turrets the machine gunners can neither interfere with the remainder of the crew, nor be inter-

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fered with by them when the tank pitches or rolls going across country. At least two machine guns can be brought to bear on any target, and on certain targets, three.

2. *Speed*:

Much greater than in previous tanks.

3. *Engine*:

Air-cooled engine.

Apart from the advantages of air-cooled engines already mentioned, it was absolutely essential to have such an engine in this tank for the simple reason that a radiator to cool an engine of the size required would have been prohibitive both from the standpoint of the space required and the weight of the radiator and water. The engine used is the most powerful of its type in existence and requires a small auxiliary engine, also air-cooled, to start it.

4. *Transmission.*

Two types of gear box have been provided:—

(i) The ordinary type.
(ii) The hydraulic type.

5. *Controls.*

Owing to the speed and weight of this tank it was impossible to control the steering and braking by hand power alone. The possibility of a tank of this weight getting out of hand going downhill or even along a level road at 20 miles an hour was a matter of great anxiety and the question naturally arose "Was an attempt being made to bring into being a monster which could not be controlled?" Control is therefore done hydraulically, and so it is possible to steer this tank, weighing nearly 30 tons, by a wheel like a car, even when travelling at 20 miles per hour. During the consideration of this braking problem, it became necessary to construct an apparatus to test the material usually used for brake linings. The best known makers of such material had no data from which they could judge whether or no their linings would stand the required test. A special apparatus had to be designed and made for this purpose.

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6. *Cooling.*

The fighting chamber is cooled by an electric fan. The engine is separated from the fighting compartment by a hollow bulkhead. By this means the cooling in this tank is better than in any other, but is still far from being thoroughly satisfactory.

7. *Visibility.*

The driver is placed far more forward than in any previous design and in consequence his view is correspondingly improved and, therefore, the speed at which he can drive across country.

8. *Control by Commanders.*

An observation cupola has been placed on the main turret from which an all-round view is obtained by the commander. He is in direct communication with the driver and the four machine gunners and the 3 pr. gunners by a laryngophone system. An indicator gear has been arranged in each of the turrets as well as in the commander's cupola by which he can direct fire on to any particular target. In this design of tank many risks were taken which could not have been taken if it had been necessary to go to production at once; but it was hoped by this means to save time in future developments and perhaps the necessity even of the construction of an intermediate experimental type. This has actually eventuated. Very much has been learned from this tank, and, even if it is never produced as a type itself, it has proved of inestimable value in producing the next type of tank.

The Medium Tank.

The Independent Tank, when passing through its gunnery trials, showed such a great advance on anything which had existed before that it was determined to try and reproduce it in a smaller form, realising that it would be impossible to carry the same number of machine guns or the same weight of armour. The tank produced is known as the 16-ton tank, and is purely experimental.

Armour. Thicker than in the Tank Medium Mark II.

Armament. There are three turrets, the main central one containing a 3 pr. and a ·303″ Vickers gun in an entirely new type of mounting which greatly facilitates the gunnery problems. The two smaller turrets each contain two ·303″ machine guns mounted

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in pairs. It is possible, therefore, to fire five machine guns to the front, or four machine guns and one 3 pr. at the same time. This tank has proved to be a very steady platform, compared with any previous type. The importance of this cannot be overstressed.

Speed. It is the fastest medium tank so far produced in our army. It climbs a slope much more easily than the Mark II because it is the first tank in which the centre of gravity is placed far enough forward. It will cross a ditch nine feet wide instead of only six as with the Mark II.

Accessibility. The engine and transmission are placed in a compartment by themselves separated by a non-heat-conducting bulkhead from the rest of the tank. This arrangement ensures a cooler atmosphere in the fighting compartment, and increases the ease with which the engine or parts of the transmission are removed.

Petrol. Is carried in two armoured compartments mounted one on each side of the tracks. The chance of a fire is greatly minimised by this means.

DRAGONS.

I have explained to you the development of tracks generally, and we will now consider the application of them to dragons.

Dragon Mark I.

Eighteen of these were made and issued to the 9th Field Brigade—the first artillery brigade to be mechanised. They were then handed on to the 1st Brigade, and are now, all of them, being reconditioned. The track was of the built-up type as used in the Mark I tanks.

Engine. Leyland 60 h.p., 4 cylinder.
Speed. 12 miles per hour on the road.
Weight. 9 tons.
Load. 10 men and 64 rounds of 18 pr. ammunition.

Disadvantages. (a) Under-powered.
(b) Width: too wide to go through gates.
(c) Weight: too great.
(d) Height: too great.

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Dragon Mark II.

These were designed in order to bring up to date the idea of an artillery tractor. They are much faster and smaller than the Mark I in every dimension.

Engine.	The same air-cooled engine as used in the medium tanks.
Track.	Of built-up type.
Suspension.	New type.
Weight.	9 tons.
Speed.	16 miles per hour.
Load.	11 men and 128 rounds of 18 pr.

The crew is well protected within splinter-proof armour. A new Mark of this dragon has now been adopted definitely for medium artillery.

Several attempts have been made to permanently carry guns on tracked vehicles from which they can be fired, the most important being the

18 PR. SELF-PROPELLED MOUNTING.

Type 1, the first of these, was very ambitious in that it allowed of an elevation of 90° for the purpose of aircraft fire, but left the gunners quite unprotected.

Weight.	12 tons.
Engine.	Air-cooled as in Medium tank.
Speed.	15 miles per hour.
Gap negotiable.	6 ft. 9 in.
Load.	18 pr., 6 men and 17½ cwt. ammunition.

The complications necessitated by making this gun suitable for A.A. work were very considerable and added very much to the "top hamper."

Type 2. Four re-designed mountings were then produced, the chief improvements being :—

(1) Protection for the crew.

(2) Means of carrying the crew with the gun when traversing.

Type 3. It was then decided to give up the idea of using this gun for anti-aircraft work. This greatly simplified the mounting and in consequence it has been found possible to give much better

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protection to the crew and to place the ammunition in a more convenient position.

Artillerie Portee.

Several methods will be tried this year at Aldershot to carry 18 pounders in lorries after the French method of "Artillerie Portee." Amongst the methods are:—

(1) Carry gun, agricultural tractor, ammunition and crew on a long "charabanc" chassis.
(2) Carry gun, with crew in a medium six-wheeler and an agricultural tractor with ammunition in another.
(3) As with (2), but with four-wheelers instead of six-wheelers.

The idea is to carry the guns long distances at high speeds without injury to them, and, when the moment arrives to take them across country, to dismount them from the lorries and tow them by the agricultural tractors, the detachments walking.

Experiments are also being carried out with an under-carriage designed to carry an 18 pr. along the road in order to save the gun being damaged at high speeds. This device is easily attached to the gun-carriage. Trials have proved that it can be fixed by four men in $3\frac{1}{2}$ minutes, and that it runs quite smoothly on roads up to about 15 or 20 miles an hour. We have failed to upset it by taking it round a sharp hairpin turn at 20 miles per hour. When going across country the under-carriage is dismounted and carried in the tractor. It is also being experimented with by the French Artillery.

Carden Loyd Machines.

We will now consider an entirely different type of track which has been developed in the last three years and is used on the Carden Loyd machines. The first machine of this type was exhibited in an old mews in Kensington about $2\frac{1}{2}$ years ago. It was a single seater machine, with a Ford engine and transmission. The driver sat on the axle casing with one leg each side of the engine, and if he was wise wore asbestos trousers. He had a pedal for each foot by which he steered the machine by braking. The gears were operated by a joystick as in an aeroplane. There was no articulation, no springs and no rollers for the track,

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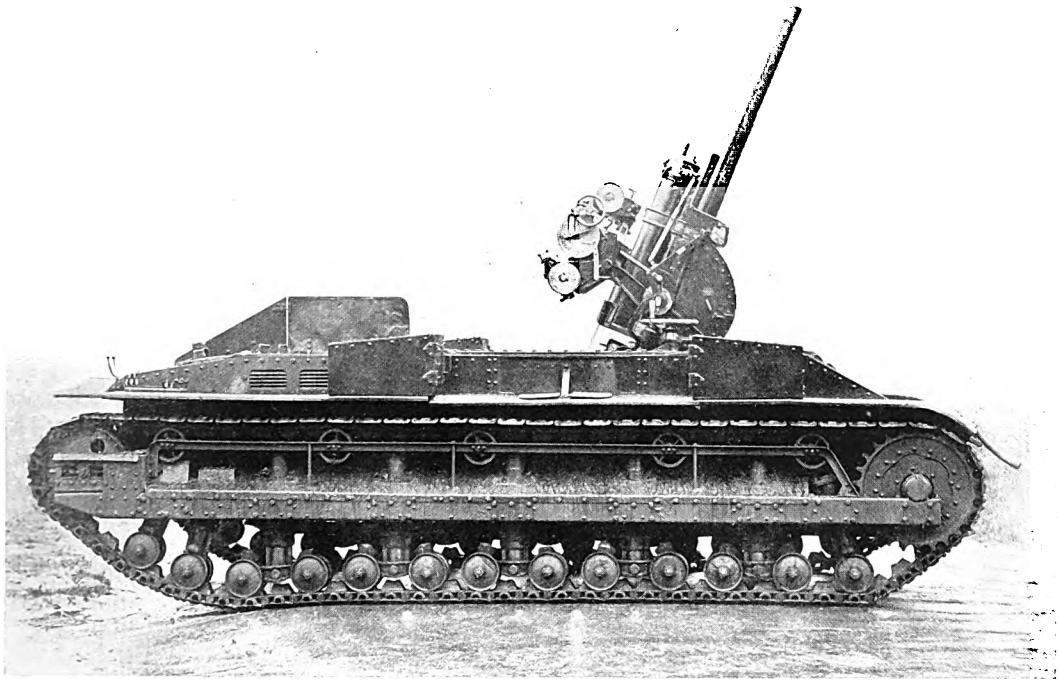
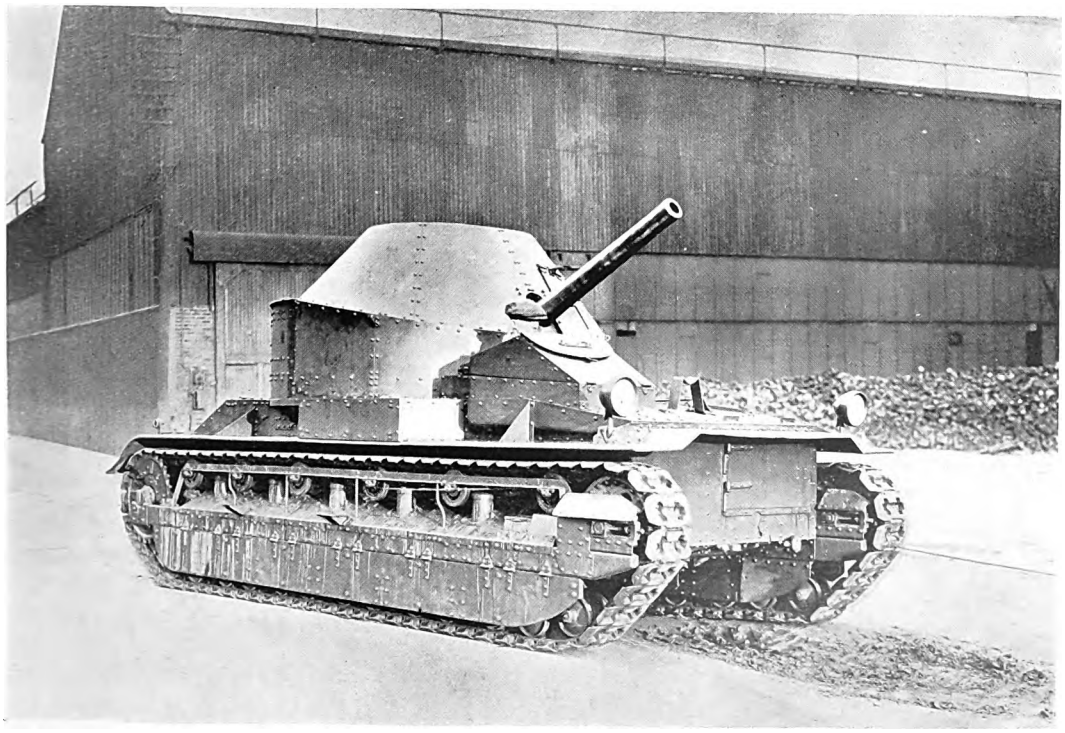


"18 Pounder on Self-propelled Mounting: Early Type."



"18 Pounder on Self-propelled Mounting: Latest Type."

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which was ordinary conveyer chain, which had the advantage of being very cheap and easy to manufacture. The machine progressed rather like an antelope on hard ground, but performed well on grass or soft country. It weighed about 7 cwt. The life of the track was about 20 miles. The machine was driven up two planks on to the back of an ordinary Ford touring car, kept for the purpose. On arrival at the test ground the Ford had to be upset to get the machine out. It was at once clear that this type of track would not answer the purpose, although the machine itself had been successful from the standpoint of having achieved *inconspicuousness* to a remarkable degree.

I now propose to deal for two minutes with the evolution of this track. It is an excellent example of "non-stop evolution." The second track was an improvement on the first one in that it ran on a number of lightly-sprung metal rollers. This springing increased its speed and its life. It reached a speed of 30 miles an hour and the track life ran out to about 80 miles. The third track consisted of a drop-forged steel link of one-piece construction, the external appearance of which was somewhat similar to the second. This track held together fairly well, but was so stretched after running 300 miles that it was impossible to adjust it sufficiently to carry on. The fourth track was a re-design of the third, in which the old suspension scheme was scrapped, and four 10 inch diameter soft rubber rollers substituted, fixed on a solid frame without any attempt at springing. Wheels were attached to the machine so as to reduce the period of time over which the tracks were used. In other words, wheels on the road and tracks across country. This track endured for 600 miles and the suspension gave little trouble, although the machine was very hard and uncomfortable in running and the life of the rubber rollers limited. The fifth track was a still greater advance, and in this design it was possible to include a certain amount of articulated suspension with the object of keeping the pressure on all the rollers constant. The suspension consists of having four rollers at each side mounted in pairs, in such a manner that each pair is free to rock on a connecting beam.

These machines are very simple, very inconspicuous and very cheap. They were introduced at the time when there was an

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outcry for one-man tanks. As you have seen, they developed into two-men tanks. In the future they will not be used as tanks at all, but for one of the purposes which I am about to show you.

This Carden Loyd track has now been applied to trailers with success. Up to this year no successful design of tracked trailer had been produced. These trailers are extremely inconspicuous, and have an excellent cross-country capacity and are proving to be of very great value. Their centre of gravity is so low and their articulation so good, that it is practically impossible to upset them.

Combinations of Carden Loyd tractors and trailers will now be used for the following purposes :—

(1) ·303″ machine gun carriers.
(2) ·5″ ,, ,, ,,
(3) 3″ mortar carriers.
(4) Carriers for smoke producing apparatus.
(5) Tractors for 3·7″ howitzer on trailers.
(6) ,, for anti-tank gun and crew.

This latter combination has proved, so far as it has been able to test it, a very workmanlike, inconspicuous and self-contained unit. There is, of course, a limit to the slope it will negotiate, but then the detachment can always get out and walk.

The latest development of what I will call the Carden Loyd system is the production of a machine to approximate as nearly as possible to the specification for a light tank laid down by the General Staff. Such a machine has been tested during the last few weeks, and been found to comply more or less with what was wanted. It is a two-man machine of high speed capable of crossing a ditch four feet wide. It is very inconspicuous, although it carries one Vickers ·303″ machine gun in a turret capable of all-round traverse. It has, however, the following disadvantages :—

(1) The temperature inside is high.
(2) The track is not yet satisfactory.

This machine is now being re-designed and others will be built this year embodying these necessary alterations.

Johnson Track.

To overcome the difficulty of skid steering a type of track was evolved in which the plates were joined together with a type

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of ball and socket joint in order to give it lateral flexibility. This necessitated each joint being lubricated. It showed considerable advantages in some ways over the previous types of laterally rigid tracks, but it was costly to manufacture, the lubrication was also a great difficulty and therefore often neglected, and the seals which purported to keep out the dirt and retain the oil were, in practice, not effectual. Therefore, although from a theoretical standpoint a great advance, practically it was not a success. This track was used on the first Martel tanks. It was therefore necessary to re-design this track so as to do away with lubrication. Many experiments were made and eventually a single rubber-jointed track was evolved. This was an entirely new feature, and was tried on another Morris-Martel tank. This track wore as long as three of the previous tracks and was therefore considered to be successful. Further improvements were introduced and a complete machine was built suitable for the haulage of field artillery, and has been tested by the Experimental Establishment for a distance of 2500 miles. During this test no "maintenance" of any description has been required on the tracks, which are still in excellent condition.

Five tractors of this type will be issued to the 10th Brigade at Deepcut to be tested this year. The tracks will be replaceable by wheels (this is a garage process taking four hours), so that it will be possible for the Commander to have certain of his machines permanently ready for fast road work. It would appear that this rubber-jointed track has many advantages, such as :—

1. There are no rubbing surfaces and when the rubber has perished through oil or moisture, it can be replaced.
2. No lubrication is required because there is no mechanical friction.
3. Little or no wear results because there are no wearing surfaces and the track has lateral flexibility.
4. It is much more silent than the ordinary metal track.
5. There is practically no appreciable stretch and, therefore, little or no adjustment is required and the pitch of the track remains correct.
6. There is a great reduction in shock due to the give in the rubber.

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7. Better distribution of the pressure on the track sheath and driving pulley.
8. Lateral flexibility within limits.
9. Simplification of manufacture.

It is hoped, if this track proves a success, to be able to put it on to a tank and steer it by means of steering horns. In other words it may be possible to do away even in tanks with skid steering which would be a great advantage, amongst them being the fact that the roads would be less cut up by the passage of tanks along them.

Rubber tracks.

In 1909 Mr. Kegresse, who was then in charge of the motor service of the Czar of Russia, began experiments with a view to evolving a type of motor vehicle capable of negotiating the snow. After trying many different types he evolved a unit which was very successful.

Type 1.

He escaped from Russia during the revolution and then combined with Citroen to produce the first type. Six of these were bought as battery staff cars for the 9th Field Brigade, R.A. Previously to this five of these cars had crossed the Sahara from Algiers to Timbuctoo in 22 running days. In 1924, eight of these machines of improved type crossed from Algiers to Lake Chad, and then across Central Africa where they divided into four parties and came out at Mombasa, Dar-es-Salaam, Mozambique and Cape Town. These tests showed them capable of competing with tropical conditions while hauling a heavily laden trailer.

Type 2.

It became very necessary to make certain improvements, however. In doing this:—

(a) The drive was changed to the front.
(b) A more compact layout was obtained as well as a better forward clearance.
(c) A longer lead to the driving pulley was obtained.
(d) Mud, stones, etc., were shaken off before reaching the driving pulley.
(e) Semi-elliptic springs were provided, which conduced altogether to higher speed.

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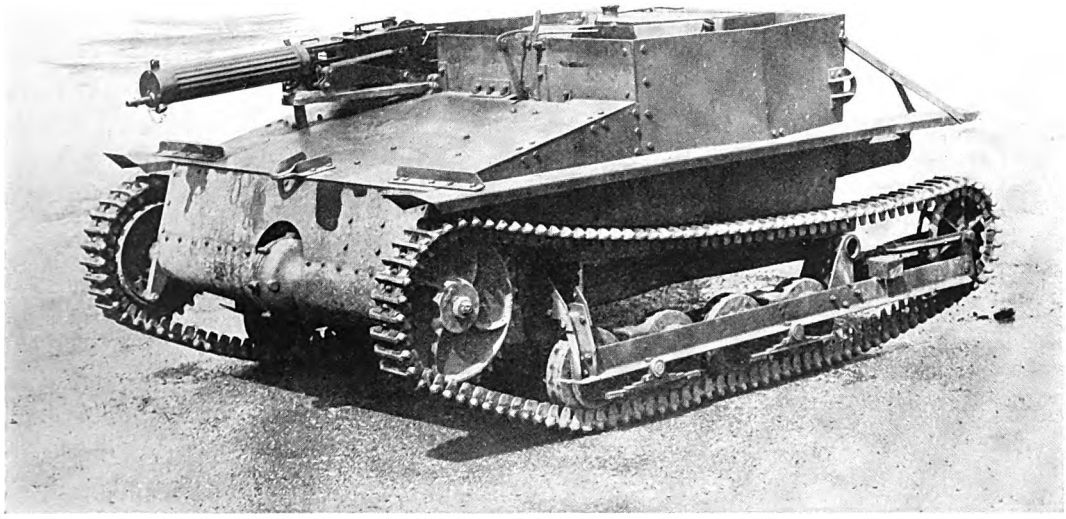

"Carden Loyd, Machine Gun Carrier."

"Carden Loyd, with Mortar."

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This type was fitted to larger and more powerful chassis, which became well known as the Burford and Crossley-Kegresse machine. Some of these are in the Service as artillery tractors, and, although out of date, will have to be worn out—this cannot be avoided in these days when economy has to play such an important part in national life. The chief disadvantages were :—

1. The driving of the endless band by *friction* between the two arms of the driving pulley is not always satisfactory when negotiating mud, snow, etc.
2. The driving effort put a very great strain on the centre teeth of the band.
3. Rubber bands were liable to be cut up by sharp stones, rocks, etc.

In order to overcome these disadvantages, a new type has been evolved in which :—

1. The drive was made positive.
2. The central teeth no longer drive but only guide.
3. The outer surface of the endless band is protected by metal shoes, but when running on the hard roads only the rubber blocks in the middle of these shoes come into contact with the ground.
4. Any damaged part of this band can be easily replaced.

This type, although a great improvement, was not altogether satisfactory as the projections on the bands and recesses in the sprocket in which they engaged quickly wore out. These points have now been replaced by lugs spaced along each side of the band, which engage with corresponding serrations in the sprocket. A machine of this type has now run about 2500 miles and shows little sign of wear, although dragging an 18 pr. and carrying a ton in weight.

Generally speaking, the advantages of the latest form of Kegresse are :—

1. Good capacity to cross rough country.
2. No joints or pins.
3. Lighter than a metal track.
4. Higher speeds than most metal tracks.
5. Silence.

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6. Possibly less vulnerable.
7. Easily repairable.
8. Does not damage road.

Five tractors with this type of track will be issued to the 10th Brigade for another of its batteries this year. They will carry about 70 rounds ammunition and 10 men. This type of tractor was tested at the trials carried out by the Belgian Government this year. It is also being used by the French in the form of an armoured car.

Armoured Cars.

Time does not allow me to go into details of the construction of all the armoured cars which have been made since the war, but the following are types :—

Type 1. Peerless Armoured Car.

A commercial type of lorry chassis which is fitted with an armoured body. It was used during the war and is still being used by the Territorial Armoured Car Companies.

Weight.	5 tons, 16 cwt.
Engine.	Peerless, 40 h.p.
Maximum speed.	18 miles an hour.
Carrying capacity.	3 or 4 men.
Armament.	2 light machine guns.
Wheels.	Solid tyres.

Type 2. Rolls Royce Armoured Car, 1920 Pattern.

A standard chassis fitted with an armoured body. Owing to its silence, reliability and high speed, useful for long distances and reconnaissance purposes.

Weight.	3 tons 16 cwt.
Speed.	25—45 miles an hour.
Armament.	1 Vickers Machine Gun.

Type 3. Rolls Royce Armoured Car, 1924 Pattern.

Standard chassis with slight modification, but with an improved design of armoured body, giving more room for the gunners and increased facilities for observation.

Weight. 4 tons 3 cwt.

Type 4. Lanchester.

The latest form of armoured car is the Lanchester, two of which

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have been put through very severe trials, and have given distinctly promising results. Their characteristics are :—

Armour.	Heavier than in previous types.
Maximum speed.	44 miles.
Gears.	3-speed epicyclic, 2-speed auxiliary gear box.
Wheels.	6-wheelers with twin tyres at the rear, single tyres in front.
Weight.	$6\frac{3}{4}$ tons.

Wheel-cum-Track Armoured Car.

It was hoped to be able to produce a machine which, while generally using wheels on the road, could be changed into one using tracks when travelling across country. Several different designs embodying this principle have been tried, but so far have not proved very successful. Experiments are still going on however in this direction.

THE PAVESI TRACTOR.

This is a four-wheel drive machine with extraordinary articulation and with a very clever design of spud. Machines of this type are used in the Italian and Spanish armies. Messrs. Armstrong Siddeley have bought the right of producing them in this country and are greatly adding to their value by putting in an air-cooled engine and a five-speed Wilson gear box. This is the same gear box as was "boomed" at the last Motor Show in their 20 h.p. car. The Pavesi was also used at the Belgian trials, and, although not doing as well in sandy areas as the Kegresse, was as good in muddy areas. Five of these machines will be given to the 10th Brigade for their 3rd Battery, so at the end of the year we shall be able to form a good idea of the relative values of this machine as compared with the Kegresse machine and the Morris Roadless Tractor.

The lateness of the hour does not permit me to go into other developments. I have attempted to give you, within the limitations of a single lecture, as good an idea as I can of the evolution of armoured fighting and other military mechanised vehicles during the last few years, and also to the extent to which other

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countries are being "combed" for information as well as machines. For instance, we are experimenting with the following :—

Kegresse machines from France; Pavesi machines from Italy; Ford engines from America; gear box from Switzerland; "heavy oil" engine from Germany.

I have also attempted to indicate the direction towards which evolution is now tending, but naturally I have only been able to touch the fringe of the subject.

Remember, we are in a purely experimental stage—feeling our way; but personally I am convinced that mechanisation has come to stay. It is the pivot round which all future armies must organise, and any keen young officers who are ambitious to get on in the Service, would do well to take the trouble to become experts in the use and design of mechanised vehicles while they are yet in their early youth. I can assure them they will find it not without its thrills.

It is said that the laws of war do not change and are the same to-day as they were in the time of Alexander the Great. Be that as it may—I have no time to argue—any laws governing a modern army must recognise in the words of Marshal Foch that "materiel is the primary condition of the efficiency of the combatants however excellent they may be. Its quality, nature and composition are the bases upon which the organisation of an army must rest in order to attain victory."

CHAIRMAN: Gentlemen, there are two points that I want to make quite clear to you. They are rather welded together, but yet they are perfectly separate. One concerns mechanisation and the other armoured vehicles. Mechanisation, as the Lecturer told you, is simply a matter of evolution. The mechanically driven vehicle in civilisation is gradually ousting the horse in exactly the same way as the horse in prehistoric days ousted other animals. Mechanisation has come to stay; there is no doubt about it. We began in the early days of the war far behind the lines, to-day you have seen mechanisation being carried into the very firing line itself. Armoured fighting vehicles we are not quite so certain about. They are being carefully studied, and the General Staff, in conjunction with the experimental and mechanical staff who actually

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make the vehicles, are going ahead with experiments in order to increase mobility and to give the Army the best possible equipment. The better equipped the Army, the more likely victory, and certainly the shorter the war. You who went out in 1914, can realise what an enormous advantage it would have been to us if we had had any of these vehicles, the pictures of which you have seen to-day.

Gentlemen, I will not detain you. I will ask you to give a very hearty vote of thanks to the Lecturer for his very interesting lecture, and for the remarkable way in which he has put such a lot of instructive matter into the space of one hour. (Applause.)

MAJOR-GENERAL PECK: Thank you very much Sir.

CHAIRMAN: That closes the meeting.

[The lecture was illustrated by 80 lantern slides. It has only been possible to reproduce 14 of them.]

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THE NATURAL HISTORY OF WAR.

By Colonel J. F. C. Fuller, C.B.E., D.S.O.

THE study of war may be divided into four great compartments, namely, the natural history of war, the science of war, grand strategy, and the art of war. The first is the framework of the remaining three, and it is the one which will be considered here. Whilst the science of war embraces the principles which govern the art of war, and grand strategy relates these principles to politics, the natural history of war relates war itself as a living force to culture and civilisation. The study of this greatest of the compartments of human conflict has remained all but in Egyptian darkness—the study of a few, the ignorance of the many. Hence the chaos of political and military opinions on war.

The Philosophy of War.

All things from atoms of force to the mind of man are the children of rhythm, that is of perpetual change. Life in its broadest sense is the shifting outcome of constructive and destructive propensities. On this realisation Spengler bases his theory of civilisation as outlined in his *Untergang des Abendlandes*, and so also does Darwin base his of evolution in the *Origin of Species*. To kill in order to live is an imperative law of nature, and though many social philosophers have attempted to prove that war does not take place between gregarious animals, their contentions are founded on a fallacy. Herb eating animals drive each other out of desirable pasture lands, they attack each other economically; flesh eaters devour the weak—their attack is physical, and so to speak military. War in the animal world is eternal, and to-day man fights much as the gorilla does, and did three hundred thousand years ago. In the VIth century B.C. Herakleitos realised this clearly when he said: "War is father of all and king of all; and some he made gods and some men, some slaves and some free." Yet, in spite of this incessant struggle, a starting point in human warfare must be decided upon, and probably the best is Bergson's (also Carlyle's)

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who ascribes the appearance of men on earth "to the period when the first weapons, the first tools, were made." Since that early date, warfare has been perpetual: "Saul may have slain his thousands, but it is to the greater glory of David to have slain his tens of thousands." Such has been the outlook of humankind. Life is brief and cheap, and the desire to triumph over the ephemeral is engrained in the bone of man. As a modern example of the glory of war, some sixty or seventy years ago, a statue of Jenner, the discoverer of vaccination, was placed in Trafalgar Square, London, and then after a few years, and without public protest, it was removed to Kensington Gardens to make room for one of a soldier of moderate distinction.

The study of society is largely the study of the human herd. In very early times mankind, like the greater primates to-day, in all probability lived in small groups of families, the coalescence of which into herds, and later on into communities, was the necessary consequence of the food quest. Warfare was then defensive in nature, and must have remained so until the invention of the bow which heralds the introduction of the first cultural period, for by offensive warfare it became possible to enslave an enemy, and so gain leisure which is the foundation of intellectual development. Amongst the simpler, and consequently more primitive, phases of thought are to be found fear and greed. Fear stimulates the imagination and leads man towards belief in invisible powers; greed accumulates and dissipates energy in trade and war. Out of these two instincts evolve amongst non-cultural peoples two great orders of society, the priests and the nobles—men of thought and men of action. The power of the first is based on spiritual force, and of the second on physical. The struggle between these two orders produces culture, and lack of it stagnation. Thus in India we find that the priests obliterated the nobles, and in China that the nobles obliterated the priests, and civilisation halts. The rest of society was made up of slaves and serfs, and, when the people were virile, oppression frequently resulted in the more animal rather than the more civilised portion of a community migrating to other lands. Hence, in all probability, the warlike propensity of the inhabitants of Europe, who brought with them not the culture but the active ignorance of the East.

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In this active ignorance is to be discovered the urge of war, and though the true object of war is, as both Cicero and Sallust declare, to assure peace, in an imperfect society all ideals end in a desire for material gain, in conflict to possess, consequently throughout history war has been symptomatic of social defects, as Briffault in *The Making of Humanity* writes of the Great War of 1914-18: "The war was but the visible avatar, the materialised out-throw of the multitudinous abominations amid which we lived." In a defective society, and still more so in a diseased one, corruption is cast off by war, either civil or foreign, for social, like human, life depends for its health on the free action of its excretory functions. Of the two great forms of war, that against a foreign enemy develops nationality and favours the conservative spirit,whilst civil or revolutionary commotions open the door to men of genius and accelerate progressive ideas. Of the two, the second, though frequently the most fertile in results, has nearly always proved itself to be the most costly. To prevent and restrict civil strife armies have been raised, for until internal tranquillity is guaranteed no thought of foreign conquest can be entertained.

The causes of war are intricate and many, and must not be confounded with the pretexts which detonate hostilities, such as the accidental spilling of a glass of water on Louis XIV's ambassador by a lady-in-waiting to Queen Anne, or the wife of an English missionary biting her thumb in the presence of King Theodore of Abyssinia. Amongst primitive peoples the motives of war are food and love, especially the second in exogamic tribes. In Assyria wars were waged to obtain labour; in Mexico to propitiate the gods; in ancient Persia and Peru to proselytize, and amongst the Romans to gain frontier security as well as wealth. Broadly speaking the desire for peace, and for the maintenance of peaceful activities, good or bad, have been the principal motives of conquest. In this respect modern wars are not far removed from ancient ones. The supposed infringement of national honour by the execution of Louis XVI, in 1793, initiated a war which lasted for twenty years, a war between two systems of thought. In 1914 the *direct* cause of the Great War was a threat to frontiers, and to-day one of the standing causes of war is the protectionist system, and the establishment of tariff boundaries. Finally, man, it must be

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realised, is still the savage, for as a French poet has said: "Le vieux sang de la bête est resté dans son corps." In the ignorance of social harmony, national or international, lie deep the causes of war, so that it may justly be said that every ignorant person, or society, is a standing danger to the peace of the world.

On the plinth of General Sherman's statue at Washington are engraved these words: "The legitimate object of war is a more perfect peace"; inversely had it not been for the wars of the past the World to-day would still be in a state of barbarism. Men never seek change as long as they consider themselves comfortable, and the comfort of one age is frequently the discomfort of the next. War not only breaks down the barriers between nations, but within a nation itself it uproots dogmas and conventions. In primitive times war was a moral necessity whatever it is considered to be to-day. It was, as Maudsley writes in *The Pathology of Mind*: "the divinely appointed instrument of human progress," and "carnage the immoral-seeming means by which the slow incarnation of morality in mankind has been effected." It has hardened races to withstand changes in social structure; it has constituted a school for heroism and a play-ground for valour. "That which invests war, in spite of all the evils that attend it, with a certain moral grandeur, is the heroic self-sacrifice it elicits," thus writes Lecky in his *History of European Morals*. The era of great wars is the era of great empires, and as Ruskin noted, great nations are born in war and decay in peace. Nor must it be supposed that virtue is patent to modern warfare, for as ancient as the Code of Manu is the chivalry of war; in this code poisoned arrows and other cunning devices are prohibited. Even in the turbulent days of the Religious Wars in Europe, Rabelais pointed out that "according to right military discipline, you must never drive your enemy into despair."

Until humankind has evolved a more perfect state of peacefulness, wars are likely to be necessary as moral purgatives. In the past, when warlike fervour has died down, decadence has set in. This is well depicted in Botticelli's famous picture which shows satyrs stripping Mars of his armour as he lies sleeping by the side of Venus. As attack masters defence so gradually does the economic replace the martial spirit. A warlike people worships women, but

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economic mankind enjoys them only, which is the first sign of an advancing civilisation. Progress demands that from time to time things be thrown into the melting pot of war, for progress is fed on the mixed cultures evolved in conflict; yet the military spirit in itself is antagonistic to civilisation, because it is the child of its imperfections.

The Classical Period.

The classical period of war constitutes a military microcosm, because our knowledge of it is restricted in detail, and yet is sufficient in essentials for a boldly outlined picture of war to be painted. During this long period of some fifteen hundred years all the salient factors in military science and art are clearly discernable, yet unless these are woven on the framework of the natural history of war the picture is apt to become confused and unintelligible.

The first great factor which confronts the student is that of geography. It was geography which separated the Greeks into city states, and which enabled the Assyrians and Persians to create a centralised empire. In more than one respect the Taurus range of mountains was the dividing line between ancient Europe and Asia, that is between Greek and Oriental civilisation. In Greece itself the pass of Thermopylae and the isthmus of Corinth were the two most important factors underlying Grecian politics and strategy.

As important as geography, and closely related to it, was the economic condition of Greece. From the earliest age the Greek city states had suffered from food shortage; cattle were few in the land, and little corn was grown save in the valleys. As the city population increased, the only outlet was colonisation, consequently we find from an early date that the Greeks formed settlements overseas, the most extensive being in Pontus, Egypt and Sicily, the great grain centres of the Mediterranean world of the Vth century B.C.

These two factors, the geographical and the economic were the two halves of the mould in which Greek tactics and grand strategy were cast. The food stocks were concentrated in the valleys, and destruction of them entailed not only starvation but loss of exports of oil and wine whereby foreign corn could be purchased. This factor determined the composition of Greek

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armies even as early as the VIth century B.C. As most cities were walled, the only means of coercion was destruction of food stocks, and unless the city attacked had access to the sea and possessed a powerful war fleet, as Athens did in the Vth century B.C., either the enemy destroying the crops in the valleys had to be destroyed, or submission tendered. Thus it happened, almost without exception, that battles were fought on the plains, and for such, failing heavy cavalry which the Greeks did not possess, heavy infantry, hoplites, were the most effective arm. Further, battles were seldom fought during the winter, not because, as it is frequently supposed, the rigour of the climate prohibited them, but because there were no crops to destroy; and as the defensive was still the stronger form of war, the assault on walled cities offered little chance of success. The influence of topography on military organisation and tactics is well exemplified in the Persian Wars. The Persians depending on cavalry found narrow valley fighting most difficult; equally on open plain land, where flanks could easily be turned by mounted men, did the Greek hoplite armies find themselves at a serious disadvantage.

By the VIth century B.C. the population of Attica had outgrown its food supply, with the result that the Solonian legislation recognised that Attica had to be converted from an agricultural into a manufacturing state. The policy of Themistokles (B.C. 514-449) was one of commercial expansion, the pressing problem of Attica being control of the sea routes leading to the corn areas, the control of the corn areas themselves, and provision for unemployment. From B.C. 457 to 404, during the Peloponnesian Wars, Athens waged a desperate contest to control the sea routes to Sicily and Egypt. Perikles (B.C. 490-429) in his turn based his grand strategy on the economic factor. If he could control Egypt, Sicily and Pontus, Athens would become mistress of the Hellenic states. Lack of consolidation at home wrecked his foreign policy which came tumbling down like a house of cards when Megara and Bœotia revolted in B.C. 447. Thereupon Perikles removed the treasury of the League from Delos to Athens, and so for the time being became financial autocrat of Greece.

The whole of this period is full of grand strategical lessons, little discernable in their true perspective unless related to the

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natural history of war of this period. Throughout, the economic factor plays the leading part. The interminable struggles between cities and leagues are not objectless, but one and all are based on food supply. The command of the sea, as in modern times, played a leading part. The quarrel of Corinth and Athens over the island of Corcyra was not a mere pretext for the outbreak of the second Peloponnesian war, but a definite cause, for Corcyra was the strategic focal point of Sicilian and Italian trade. The whole war was a food war, and a war for colonial control, not of distant lands but of distant markets and centres of supply.

From decentralisation and spasmodic confederations, the two outstanding curses of ancient Greece, a change towards centralisation was made under Philip of Macedon, and was brought to an apex by his son Alexander the Great. The military skill of this super-man of antiquity is from the point of view of the natural history of war but of minor importance. Already long before his day, the Græco-Persian Wars (B.C. 490 and B.C. 480) and the battle of Cunaxa (B.C. 401) had shown clearly the weakness of the East. The Peloponnesian Wars and the Peace of Antalcidas (B.C. 386) had equally shown the weakening of Greece. Hitherto gold had been the Persian weapon against the Hellenic militias, but Philip had left Alexander a more powerful arm—a national army, and with this he set out to conquer the World of his day. First he secured command of the sea, secondly command of the Egyptian corn area, and thirdly of Persian gold which gave him command of the land. The result was the destruction of two civilisations—Greek and Persian—and the creation of a Hellenistic World. On Greek thought and Persian gold were laid the foundations of what to-day we call Western Civilisation. Greece conquered the world of thought, and Alexander scattered these thoughts from the Ægean to the Euphrates. On Persian gold Alexandria and a hundred great cities were founded, and from these cities a scientific age arose which, had it not been for an accident of history, might eventually have rivalled our own. This accident was the occupation of the swamps of the Tiber, traditionally in the VIIIth century B.C., by a virile tribe of barbarians known to history as the Romans.

For these sturdy farmers war was a domestic necessity, shut in as they were by hostile tribes. Divided at an early date into two

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castes, the high and low, quarrels and insurrections were frequent, consequently the Patricians seized the lands of the people and filled the jails with debtors. In these acts may be discovered the beginnings of Rome's future world policy, which was one of frontier security and the search after gold. Internal tranquillity was eventually established when the Roman period of foreign wars opened, and as Draper says in his *History of the Intellectual Development of Europe*: "As the circle of operations extended, both parties see their interest in cordial coalescence on equal terms and jointly tyrannize exteriorly." In the western Mediterranean zone, Spain, a great silver producing country, was the main bone of contention between Rome and Carthage, just as in the eastern zone the Lydian gold mines had been between Greeks and Persians. Here, in Spain, the rising Republic came into contact with the Carthaginians, and by doing so unconsciously set to work to complete Alexander's dream of a centralised world governed by one all-controlling authority. The steps taken were very similar, namely, command of the sea, command of economic resources, and then destruction of the enemy's central authority, that is command of the land. Roman military glory ended at Zama (B.C. 202), and from the destruction of Carthage, in B.C. 146, onwards, Rome's policy was the disorganisation of neighbouring states. Once disorganised, absorption became easy, and, generally speaking, the Romans were lenient towards the conquered, for in them they saw a source of wealth. Conquest resulted in a vast accumulation of slaves, and many of the later campaigns of the Republic and Empire were little more than slave hunts. As the slave population increased, the native husbandmen, who had formed the backbone of the legions, were driven from the land, and filled the cities with unemployed. During the IInd century A.D. gold poured into Rome, for the whole urge of imperial expansion was the search after wealth. As the peasantry became demoralised, more and more had the government to rely on a mercenary force, and the more it did so the more centralised did it become. Towards the middle of the IIIrd century, through greed as much as through mismanagement, gold rapidly gravitated from Italy towards the centres of exchange in the East. This was the true beginning of the Decline and Fall, for the stability of Roman rule depended on

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ability to pay her mercenary legions, and to feed her unemployed population which was now a veritable mill-stone about her neck. The Empire had been cemented together with gold, and without gold it could have but one end—disintegration. Meanwhile a new force was being evolved within the intestines of the Eternal City.

The Dark Ages.

The organisation of a permanent police force by Augustus, which replaced the mercenaries of the Civil Wars, was the triumph of the capitalism of this age, and for four hundred years this corps of hirelings crushed revolt within the Empire. Besides eventual lack of money to pay this police, the doctrines of primitive Christianity, communistic in nature, gradually undermined its discipline and *moral*. The dullness of Roman life which followed the centralisation of power opened the door to many ecstatic sects, one of which was Christianity. The police army being a mercenary force, recruited mainly from the barbarous tribes of Spain, Gaul and Germany, was easily attracted towards new wonders and superstitions. The Christians as a sect stood apart from the Empire, or constituted, as several historians have said, an empire within the Empire. Though the eventual Church made no attempt to abolish war, the early Christians theoretically anathematised it. The war they waged was the war of the Word, they were hostile to wealth and to the social order, and carried on extensive propaganda in the legions, for they firmly believed that the end of the world was at hand, and that the only world worth fighting for was the next. As surplus of wealth had destroyed the native soldiers of Rome, so did an excess of faith undermine the discipline of the mercenaries, yet curious as it may seem the discipline of the soldier became the model for the early Church.

The Empire now definitely entered its final stages of decadence. It was too small, and not, as many suppose, too large to survive. It lay like an oasis in a desert of barbarians, and by degrees was buried in its shifting sands. Not only could soldiers not be found, but generals could not be bred, consequently the legions were commanded by barbarians. At length these generals and their men could not be paid, then civilisation foundered. At midnight on the 24th April, 410, eleven hundred and sixty-three years after

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the foundation of the city, the Salarian Gate was treacherously opened to Alaric, and Rome was sacked by the Goths.

The fall of Rome was the most appalling disaster in history, yet we find St. Augustine writing: "In the place of this earthly city, this vaunted mistress of the world, whose fall closes a long career of superstition and sin, there shall arise 'the City of God.' The purifying fire of the barbarian shall remove her heathenish defilements, and make her fit for the kingdom of Christ. Instead of a thousand years of that night of crime, to which in your despair you look back, there is before her the day of the millennium."

The five centuries following the sack of Rome cover a period of social and military degradation unrivalled in recorded history. In the East, the age of faith was destroyed by the Vandal invasion of Africa, by the campaigns of Chosroes, King of Persia, and by the onrush of the followers of Mahomet. The loss of a central power made wars incessant, famines and pestilences followed in their wake, with the result that during the reign of Justinian (483-565) the human species was diminished by the almost incredible number of one hundred millions.

The conquest of Africa by the Vandals cut off the Italian supply of corn, and Italy was swept by famine. In the north and west the barbaric races of Germany swarmed over the land pillaging and massacring. Highly imaginative, and fearing natural forces, they carried their dream of Walhalla into the Christian faith, and imbued Europe with the terror of death. Their priests, heavenly warriors who protected them from Nature, could, when once Christianised, equally well protect them from the powers of Satan, king of the dead. The Teutonic warriors did not, as many German writers affirm, regenerate the broken Roman world, for what they did was utterly to barbarise it.

Strange as it may seem from the modern point of view, the Church did not object to the barbarians, she welcomed them, for in them she found ready converts. This welcome undoubtedly facilitated their invasions, and as they swept over the Empire the defence rapidly preponderated over the attack, and rendered centralisation of government impossible. Strongholds sprang up on every crag, and incessant wars were waged between the bands of brigands which infested every country.

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The dogma of hell not only harmonised with the crimes of the age, but walked daily with men. On the nature of war this dogma had a strange yet all-powerful influence, for the art of war was replaced by the art of the magical attack. Constantine and Clovis were both promised victory through faith, that is through a miracle. Enchantments were used as engines of war, attacks were made by talismans, and on the interpretation of omens were the problems of strategy decided. So all-powerful became the belief in relics that wars were waged to possess them, and St. Bernard looked upon a campaign merely as the vehicle for miraculous expressions.

A typical example of the attack by magic is the quarrel between Pope Gregory VII (Hildebrand) and Henry IV in 1076. "Henry marched on Italy," writes Brooks Adams in his *Law of Civilisation and Decay*, "but in all European history there has been no drama more tremendous than the expiation of his sacrilege. To his soldiers the world was a vast space, peopled by those fantastic beings which are still seen on Gothic towers. These demons obeyed the monk of Rome, and his army, melting from the emperor under a nameless horror, left him helpless." Thus through magic, and not through force of arms, did Henry appear before the gate of Canossa "a penitent in white raiment standing in the dreary snow of three winter days" seeking the pardon of the magician who had defeated him.

In the XIIth century the miracle was the highest expression of force, especially in the north, but in the south a change was already taking form, and it was initiated by the Arab conquerors of Spain.

In 632, Mahomet died, and within twelve years of this date the Arabs reduced 36,000 cities, towns and castles in Persia, Syria and Africa, and thirteen years later, under the caliphate of Ali, learning had become the settled principle of Mohammedan culture. This rapid progress, the most wonderful in history, was due to the sword, for in wars of conquest, other than by barbarians, phases of existence are passed through with extreme rapidity. Crossing over to Spain, by the year 732, the Arabs had reached the centre of France, and at Tours were defeated by Charles Martel. "That battle," says Draper, "fixed the religious destiny of Europe."

To the Arabs, Western Civilisation owes its present knowledge

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of science and industry. Their culture fertilised Europe, sowing the seeds of future grandeur in the blood-soaked fields of the Dark Ages. Nor was the spirit of Arabian organisation and chivalry to be denied its influence on the superstitious religion and barbaric warfare of this period, for in the XIIth century the Benedictine Monastery of Cluny set out to model the Christian world on the lines of Islam, and from out of the Crusades sprouted a new doctrine of war. These were two of the most portentious events in European history.

The Dawn of the Renaissance.

From the opening of the IVth until the close of the XIth century the feudal system had taken form, sprouting out of several old Roman institutions, its eventual structure, always somewhat amorphous, was shaped by the weak having to seek protection of the strong. By the close of the XIth century many of the families of the old robber chiefs had settled down and become local overlords, offering protection for service, and linked to what then passed as the central government by a very attenuated allegiance. Many of these petty despots, as well as followers of religious orders had for years past undertaken pilgrimages to Palestine, not only to save their souls but to fill their pockets, for the trade in relics was a very lucrative business. The Mohammedans not understanding the purport of these strange journeys had on occasions maltreated the pilgrims, with the result that Peter the Hermit, who had witnessed certain barbarities in the East, began preaching his famous "Deus Vult." Urban II, a French Pope, then embroiled with Philip of France, in order to extricate himself from his entanglement, in 1095, at the Council of Clermont, proclaimed the first Crusade, the assembly being convinced that it was the will of God on account of a shower of shooting stars which took place on 25th April.

Amongst the primitive Christians, the fame of the soldier which illuminated the classical age had been replaced by the holiness of the ascetic. The coming of Mahomet reversed this change, and from 1095 onwards war became the duty of Christendom, the cross as a symbol of the forgiveness of sins being replaced by the sword, on the cruciform hilt of which the crusader swore to retake the Holy Sepulchre. In the first Crusade some 500,000 persons perished,

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but its main result, increasingly accentuated by those which followed it, was to enable the Papacy to seize the resources of Europe, in fact financially Europe became tributary to the Pope who soon had fiscal agents in every capital.

The changes which now swept over Europe were extraordinary to a degree, the most powerful being, economic revolution, loss of faith in miracles, and a return to military art, all three of which were interdependent. In the East the veil of barbarism was lifted, and what astonished the Crusaders most was that God could be so kind to the heathens. From the East came the silkworm, the mulberry, the plum, windmills, refined sugar, glass, silk, carpets, brocades and Damascus steel. Not only was it soon discovered that miracles were bad tactics, but that profit could be made out of other things besides relics and talismans. The Crusaders left Europe crude fetish worshippers, they returned, at least some, vastly enlightened. Simultaneously the culture of the Moors crept into Sicily, southern Italy and over the Pyrenees, the rebirth of European literature dating from the songs of the troubadours.

The Crusades caused a steady stream of money to flow into Italy, and with money came leisure and then culture. Culture in its turn began to loosen the bonds of serfdom, municipal liberties were founded, the population increased, and labour lost some of the stigma so long attached to it. All these things and many others date from the beginning of the XIIth century, the general result being that the idea of war as national suicide began to take form. This reacted on military art and organisation; discipline, hitherto unknown, was established in the idea of chivalry. The art of engineering rapidly advanced as wealth increased. Military Orders were established, such as the Knights of the Temple and the Knights of St. John. In this monastic standing army may be seen the beginnings of an attempt to make the attack superior to the defence, without which taxes could not be collected, or tranquillity maintained. The art of military engineering, learnt in the East, placed a formidable weapon in the hands of the Church whereby she could reduce to submission the feudal nobles when they opposed her. "The whole burden of the war was thrown upon the Church, and in all modern history nothing is more wonderful than the way in which the work was done."

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Under Innocent III (1198) the papacy reached the zenith of its power, but after the hideous Crusade against Constantinople in 1204, it entered a rapid decline, the two main reasons being, the loss of faith in miracles and the increasing growth of trade. As early as 1134 people had been burnt in Languedoc as heretics, yet heresy increased as the power of miracles declined, and even the appalling Crusade against the Waldenses in the South of France could not stamp it out. Hand in hand with this intellectual revolution proceeded the economic one. From the middle of the XIIth to the XIIIth century Europe experienced great trade prosperity. Money now began to replace imagination, and as feudal power weakened, the communes combined not only for purposes of trading but for trade protection. In the early middle ages secular security had been based on physical force—the swords of the Barons and the spears which they commanded. As trade grew, by degrees it was based on money, that is on the power to hire mercenaries, or police, for the burghers themselves were not of fighting stock. The mercantile mind is unimaginative, it is lacking in the martial spirit, so we find that as the development of scepticism in the XIIIth century led to the Reformation in the XVIth; so also did the increase of wealth of this same century, more so than the adoption of firearms in the succeeding one, lead to the revival of infantry, and the replacement of cavalry by infantry in the same century which witnessed the work of Luther.

As the Papacy turned from miracles to money, it lost its power of attacking the *moral* of its turbulent subjects. Such magical attacks as those of Gregory on Henry in 1076, and of Innocent III on Philip in 1200 had lost their power, this is clearly shown in the quarrel between Philip of France and Boniface. The Pope excommunicated the King and anathematised his posterity to the fourth generation, but what was the result? On 7th September, 1300, the Vicar of God was attacked by hired banditti at Anagni, and whilst his cardinals escaped through a sewer, he was strapped, face to tail, on a miserable horse and led off to prison. The attack by magic was at an end.

The influence of money now became more and more pronounced. The ceaseless persecution of the Jews had caused them to discover the art of making gold invisible by bills of exchange.

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This had a tremendous influence on war, since its sinews, now that mercenary forces could be bought and sold, might instantaneously be moved from place to place. The magical attack on Philip having failed, the papal hierarchy was paralysed by fear, and Clement, who succeeded to the Papacy in 1305, consented not only to the taxation of the clergy but to the seizure of the property of the Templars. In 1314, Jaques de Molay, grand master of the Order, was burnt alive—the spoilation of the Church had begun, and another world revolution was initiated.

The Renaissance and the Reformation.

For a moment to recapitulate: Since 410, when the centralising power of Rome came to an end, Europe had been unconsciously striving to re-establish it. Out of brutal chaos the Papacy produced a magical cosmos cemented by the fear of hell. Then came the Crusades, and locomotion, as it always must, resulted in intellectual development. In its turn this development at one and the same time weakened papal power, and turned men's minds towards the gaining of wealth. The destruction of the feudal system by the Papacy left the communes supreme once the Papacy itself entered its decline. Modern democracy was now born, and the arm of a democracy is not an army of nobles but an army of the people; not knights in armour, but men on foot; not soldiers to pillage but a police force to prevent pillaging. Once this force came into being, all that was necessary was to discover a weapon which would render the attack stronger than the defence—then and only then could internal tranquillity be established, and centralisation take form. This weapon was gunpowder.

Gunpowder, as Carlyle writes in *Sartor Resartus*, "Makes all men alike tall . . . . at last, is the Goliath powerless, and the David resistless; savage Animalism is nothing, inventive Spiritualism is all." *Par excellence*, gunpowder is the democratic weapon, the weapon of the people, consequently Condorcet, in his *Tableau de l'Esprit Humain* rightly connects the rise of infantry with the rise of democracy. Gunpowder, by restricting brigandage enabled law and order to be established; and as it rendered the attack overwhelming, the general adoption of fire arms was rapidly followed by centralised control and the rise of modern kingdoms.

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As gunpowder was one of the many gifts Europe received from the Arabs, so also were the mariner's compass and the art of making paper; these also had a profound influence on European culture, and through culture on the history of war. The discovery of America changed the channels of commerce, and Vasco de Gama's rounding of the Cape, six years later, in 1498, dislocated the economic foundations of Europe. The printing press and the manufacture of paper, without which type-setting would have been almost useless, gave expression to the freedom of thought of the day, and stabilised language. Henceforth the pen was to be mightier than the sword. The discovery of the mines of Potosi, in 1545, flooded the world with silver, utterly corrupting Spain. Sunk in superstition and ignorance, the wealth of the imaginative Spaniards soon passed into the hands of the economically-minded peoples of the Reformation—the English, the Dutch and the Swedes, for in the silver of Potosi, quite as much as in the thunder of Luther, is to be sought the cause of the religious wars which devastated Europe from 1562 to 1648.

From the religious point of view the Reformation was a decomposition rather than a revival. From the XIIth century onwards the Papacy had steadily lost control, and this control was never re-established by the Protestants, who frayed away from the central idea of religious liberty into innumerable and generally hostile sects. The leaders of the Reformation, and particularly Luther, were as opposed to intellectual freedom as was the Papacy; Luther himself denounced both Rome and Reason as "Die verfluchte Huhre Vernunft." The mainspring of the entire movement was neither religious nor intellectual, but economic, it was a strike against indulgences, in fact against the papal financial system of the day. The Religious Wars of the XVIth and XVIIth centuries were at base economic struggles wrapped up in the same idea which inspired religious persecution. They were wars of money, of financial control, and freedom from it in its centralised form. In 1555 a patchwork religious settlement was arranged at Augsburg.

The influence of wealth on society was the pivotal condition of this age. During the feudal period the strength of the Barons lay in men and not in money, there was no capitalist class, and therefore no competition, consequently society was all but station-

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ary. The increasing wealth of countries, and of England in particular, had the same influence it had had on the Roman Republic in the Ist century B.C., it tended towards the elimination of the yeomanry class, and the consolidation of land in the hands of a new economic nobility. England during the Middle Ages had been peopled mainly by farmers who supplied the Barons and the King with excellent infantry, yet in Henry VIII's reign this class was rapidly becoming extinct. To control the Church, the Tudor sovereigns robbed it, and to control the people they enslaved it, using the clergy to preach not the infallibility of the Pope but the divine rights of the King. Money now begins to take its ultimate form in the idea of a standing army, that is of a police which can enforce the word of the clergy as dictated to them by the King. The landlords of the XVIth century were protected by state mercenaries—police—the monied nobility feared the farm populations and did their utmost to exterminate it. It was at this time, particularly in England, that the hatred of the soldier by the *nouveaux riches* took form, and has endured to present times in the fear of the monied classes of a standing army other than a police force to protect their interests.

The Foundations of Modern Europe.

The rapid replacing of the martial by the economic spirit in the XVIth century had a remarkable influence on the destiny of England, and through England on the destiny of the world. During the period of the great landlords, that is from the Reformation until 1688, the dearth of great soldiers in England is more than a coincidence. The fact is that they were not tolerated by the economic class which now held the reins of power, the only noted exception being Cromwell, of yeoman stock; all others, such as Drake, Frobisher, Raleigh, and later on Clive, sought free scope to their energies on or overseas. After the battle of Flodden Field, in 1513, no opening at home was left for English soldiers and adventurers, so we find that the discontented nobles took to piracy and founded the Empire, whilst the new nobility, such as the Dudleys, Boleyns, Cecils and Howards, men of the economic spirit, gained possession of their lands, and took care that their former owners should be allowed no voice in public affairs. Curious as it

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may seem, this terror, that the soldier should speak his mind on politics still governs the British Army, for in it freedom of speech is rigorously suppressed.

The wealth captured by these freebooters was immense, and when the time came for England to support Gustavus Adolphus in the Thirty Years War we find that it consisted in money and not men. This support she has without fail rendered her allies in every great war since the days of the Tudors down to 1919. Lack of military strength could only be made good by establishing allies on the continent, and though the idea of the balance of power, as a means of maintaining peace is a very old one, it was not until after the treaty of Westphalia had been signed that it took its full and modern form as the keystone of British foreign politics.

The origins of the Thirty Years War were largely economic. The Wars of Religion in France and in the Netherlands which preceded its outbreak were quite as much contests between two theories of human progress as between two religious schools of thought. The Catholics represented the old conservative and imaginative society, and the Protestants the economic and progressive. It was during the Reformation that, as Ulrich von Hütten says: "Men began to awake and live." Spain and Portugal bloated with the wealth of the New World, were blind to the awakening intelligence of the North. There, not only was the reformed faith gripping the hearts of the people, but the command of the Baltic was daily fostering hostility between Netherlander, Dane, Swede and Pole. The *Dominium Maris Baltici* became *the* question of Northern politics. In 1561 Sweden acquired Esthonia, and by this annexation became a continental power. Behind Poland stood the forces of Catholic Europe; Spain, Austria and Denmark ranging themselves on her side, whilst James I of England, canny and cautious, hesitated whether to support Swede or Dane. The Baltic question soon became a European problem, and it was this problem quite as much as the religious controversy between Catholics, Lutherans and Calvinists which shaped the course of strategy which from the death of Gustavus Adolphus, in 1632, onwards, more and more, was directed by the economically minded Richelieu. The will of this extraordinary man moulded the destiny of France to the year 1871, for it was not so much the

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vanity of the French as the centralised administration he established which caused France to become from the days of Louis XIV the war irritant of Europe.

The Peace of Westphalia, in 1648, not only closed the Wars of Religion, but closed the European Age of Faith, and so rendered wars of religion impossible. It was from this date that modern Europe emerges from its amorphous stage and definitely takes form. The economic spirit had irrevocably triumphed, reason had replaced faith as the alembic of human destiny. War now entered upon a new path, the path of wealth in place of religion. The frequency of wars declined. Whilst in the early Middle Ages the whole of Europe was swamped by brigandage and individual conflicts, and whilst in the later, these conflicts took the form of feudal forays and raids, after the Peace of Westphalia wars more and more were waged, not by the people, or the nobles, or the priests, but by kings rendered mighty by gunpowder and gold.

The growth of commerce and industry is not possible in a nation perpetually at war; hence, it was obvious to all men that neither Pope nor Emperor were capable of exercising any form of centralised control, to check the greed of kings and soldiers the only persuasive was that of the law of nature, the *jus naturale* of ancient Rome. In 1598, Alberico Gentilli published his book *De Jure Belli*, he was followed by Richard Hooker who was the first to make use of the term "law of nations." At length appeared Grotius (1583-1645), the founder of modern international law. The influence of Grotius and his *confrères* has been immense, and is still steadily gaining power. "What we have to notice," writes Sir Henry Maine in his *Ancient Law*, "is that the founders of International Law, though they did not create a sanction, created a law-abiding sentiment. They diffused among sovereigns, and the literate classes in communities, a strong repugnance to the neglect or breach of certain rules regulating the relations and actions of States. They did this not by threatening punishments, but by the alternative and older method, long known in Europe and Asia, of creating a strong approval of a certain body of rules." The centralising force was therefore sought through moulding opinion rather than by the threat of physical conflict, or religious terror.

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From the days of Gustavus Adolphus onwards the political influence of gunpowder grew rapidly, equipment became costly, warfare more complicated, and the invention of the bayonet, in 1671, gave infantry supreme power on the battlefield. A separate military profession became indispensable, and consequently the military spirit of the mass of the people was curtailed. Large numbers of men were weaned of their warlike habits, and ceasing to be occupied by war and theology turned their activities towards trade and commerce. Though trade and commerce are antagonistic to war, yet we find, once gunpowder has established internal tranquillity, so ingrained is conflict in human society that commercial jealousy becomes a cause of war. Mill, writing on this subject in his *Political Economy*, says: "The feelings of rival tradesmen, prevailing among nations, overruled for centuries all sense of the general community of advantage which commercial countries derive from the prosperity of one another; and that commercial spirit, which is now one of the strongest obstacles of wars, was during a certain period of European history, their principal cause." The political economy of the XVIIth and XVIIIth centuries was mainly directed towards diminishing the wealth of neighbouring states, the belief being that the wealth of a country consisted in gold, and if one country could drain all others of the precious metal it would obtain unlimited power. This idea, still prevalent amongst ignorant people, was the cause of most of the wars of the XVIIIth century, and not a few of the XIXth and XXth.

The Rise of Nationalism.

Whilst the religious conflicts of the XVIth and XVIIth centuries were reducing European nations to human pulp, under cover of this agony, which nevertheless freed thought from persecution, intellectual development silently but surely crept forward. Whilst the medieval world, the world of imagination was foundering, the world of reason, built by such men as Bruno, Copernicus, Galileo, Helmont, Kepler, Boyle, Bacon, Descartes, Gassendi, Halley, Pascal and Newton, rose like a phœnix from the ashes of a burnt-out epoch. The Peace of Westphalia all but synchronised with the execution of Charles I in England, and in Whitehall, on 30th January, 1649, died not only the King of England but the divine

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right of kings. A new England was born, the England of the rising middle class. Under Cromwell the Dutch Wars followed, beginning in 1652, intermittingly they dragged on for sixteen years. Their cause was purely economic, and they ended by handing over to England the undisputed command of the seas. From 1688, as Brooks Adam says: "The momentum of England suddenly increased . . . . Almost instantly she entered on a career of conquest unparalleled in modern history. Of the hundred and twenty-five years between the Boyne and Waterloo, she passed some seventy in waging ferocious wars, from which she emerged victorious on land and sea, the mistress of a mighty empire, the owner of incalculable wealth, and the centre of the world's exchanges."

On the continent of Europe the results of the Thirty Years War were that Austria and Spain, holding on to a world theory now obsolete, passed into decadence; France, centralised under Louis XIV, entered upon a period of foreign conquest, Condé endowing war with audacity, Turenne with rapid movement, and Vauban with skill in reducing fortresses. From now on to the close of the XIXth century the attack becomes the stronger form of war. Germany lay stunned, and was not to arise from her sick bed for nearly a hundred years, when, under Frederick the Great, refreshed by her long sleep, a youthful giant she strode over central Europe, astonishing the nations and preparing the dying epoch for the coming of Napoleon.

Meanwhile, intellectual development, poured as it was into a worn bottle of medieval thought, caused a strange fermentation. New cults, doctrines, dogmas and heresies sprang up like mushrooms in the twilight of approaching dawn. Philosophy was mixed with necromancy, and science with witchcraft. Faith was replaced by sceptism, a doubt without a bottom, through which ideas percolated and were transmuted into the strangest of superstitions. Then towards the middle of the XVIIIth century appeared the man, a soldier, philosopher and sceptic—Frederick the Great—who added intelligence to the audacity of Condé, to the craft of Marlborough and to the mobility of Turenne. Till now peoples had fought peoples, but the greatness of Frederick lay in the fact that he measured his small kingdom against a continent. The Seven Years War (1756-1763) was the first of the European World Wars since the

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Crusades, for it embraced Europe, India and America. The main result of this war was to prepare Europe for economic civilisation.

Since the days of Pizarro, who had murdered the Inca Atahualpa for his gold, Spanish bullion had largely been squandered on war, and had steadily flowed from Europe to the East where from time immemorial it has been hoarded, for as Jevons says : Asia is "the great reservoir and sink of precious metals." These century-old savings of rich and poor, Clive, an English soldier of fortune, now fell upon, and transported to London. Macaulay in his essay on *Lord Clive* writes : "As to Clive, there was no limit to his acquisitions but his own moderation. The treasury of Bengal was thrown open to him. There were piled up, after the usage of Indian princes, immense masses of coin, among which might not seldom be detected the florins and byzants with which, before any European ship had turned the Cape of Good Hope, the Venetians purchased the stuffs and spices of the East. Clive walked between heaps of gold and silver, crowned with rubies and diamonds, and was at liberty to help himself."

Through this curious and distant channel the treasure of the Incas passed into British hands, and through this wealth was the destiny of Europe changed, as the destiny of Greece was changed when Alexander seized the gold of Persepolis and Ecbatana, and the Romans lay hands on the spoil of Greece, Egypt and Pontus. This wealth, coupled with the inventive genius of James Watt and the sword of Napoleon, founded the industrial revolution.

The economic period of modern war was heralded by the rebellion of the New England Colonists. Essentially a farming population bred from an adventurous military and religious stock, they refused to be taxed. In England the social revolution wrought by the battle of Plassy (1757) had resulted in a steady destruction of the yeoman class. Between 1710 and 1760, three hundred and thirty-five thousand acres of common land were absorbed by the state, and in the following eighty years no less than seven million acres in addition were enclosed. The social difference between the English at home and the English in New England was already marked, they were virtually two races, the one controlled by men of thought and the other by men of action. The priests and the nobles of the Middle Ages as paramount social factors had dis-

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appeared, and were now replaced by legislators on the one side and pioneer farmers on the other. When the clash came the result was foredoomed. The more martially spirited backwoods-men and yeomen defeated the police and mercenary forces of England. The spirit of American freedom detonated the theories of the social philosophers in France, who had largely drawn their inspirations from English sources. Louis XVIII was beheaded in 1793, and France, threatened by Europe, rushed to arms, and by so doing gave definite form to the as yet amorphous idea of nationalism which, since 1648, had been struggling against kingship to manifest.

At the battle of Valmy (1792) the people of France passed through their national fire baptism, the thunder of the guns, as heard by Goethe, announcing the advent of the epoch in which we live. The armies of the Revolution were the apotheosis of infantry, the arm and military expression of democracy, the arm of the nation in arms. Chaotic, undisciplined, panic-ridden, audacious and ecstatic, France, a nation of *sans-culottes* led by citizen generals, defended herself against the skilled soldiers of emperors and kings. A totally new spirit was thus given to war, and this spirit found its focal point in Napoleon who by ploughing up the decaying feudalism of Europe prepared her for the seeds of the industrial revolution fertilised by the gold of Bengal. It was Indian gold which sent Napoleon an exile to St. Helena, and it was Indian gold which financed George Stephenson at Darlington.

Napoleon's method of war was the absolutism of nationality shaped by the absolutism of a despot. Conscription made France one in body, and the autocracy of her Emperor one in soul. The strategy of Frederick was expanded on a vast scale. Theatres of war replaced battlefields, and entire countries theatres. Frederick had endowed warfare with intelligence, Napoleon instilled into it a fiery enthusiasm. At Jena, in 1806, he pulverised an epoch; after Jena he pulverised himself. Centralisation seized him by the throat, and from a breaker of prison bars he became a forger of shackles. In other words, as he swept along his giddy course he passed out of the nebulous idea of the Revolution into the azimuth of a universal monarchy. Like Alexander, his great prototype, though he failed to accomplish his end, his end accomplished itself—a second Hellenistic age was about to manifest in Europe.

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Before all these colossal events took form, and in the year which witnessed the Declaration of American Independence (1776), Adam Smith published his *Wealth of Nations* in which he based political economy on the natural selfishness of man, and showed that man "by pursuing his own interest . . . . frequently promotes that of society more effectually than when he really tends to promote it." The theory of protection as applied to commerce he attacked, also the doctrine that the wealth of a country consists of its gold, and that, consequently, as has already been noted, the sole object of trade is to drain other countries of the precious metal, which time and again in the past has led to devastating wars. He placed on a scientific footing the theory of barter, showing that if commerce is allowed to be free its profits will be shared by every country engaged in it, and that consequently the benefits of trade are reciprocal. Further, he showed that nations most devoted to industrial enterprise are not only the wealthiest and the most pacific, but the most likely to wield the greatest power in war. This is the main condition which differentiates ancient from modern societies. When war depended on valour, a rich nation frequently fell victim to the virile barbarians surrounding it. "Since, however," writes Lecky, commenting on this idea in his *Rationalism in Europe*, "the invention of gunpowder and the elaboration of military machinery, war has become in a great measure dependent upon mechanical genius, and above all upon financial prosperity, and the tendency of the balance of power is therefore to incline steadily to the nations that are most interested in the preservation of peace."

"Well may it be said of Adam Smith," writes Buckle in his *History of Civilisation*, "and said too without fear of contradiction, that this solitary Scotchman has, by the publication of one single work, contributed more towards the happiness of man, than has been effected by the united abilities of all the statesmen and legislators of whom history has preserved an authentic account."

THE FOUNDATIONS OF INTERNATIONALISM.

In order to understand the changes which now took place in the relationship between economics and politics, changes which had the most pronounced influence on war, it is necessary to realise that, though the entire structure of the civilised world has changed

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during the last hundred years, the old political theory of government remains much as it was at the beginning of the last century. In 1760, that is three years after the victory of Plassy, a complex system of credit sprang up in England, just as it did in Germany after the Franco-Prussian War, and in both countries the reason was the influx of bullion, in the one case from India, and in the other from France. Borrowing on a large scale was now facilitated, agriculture and industry were rapidly centralised, and not only was the small farmer pinched out by the great landowner, but as steam-power took form, as it did towards the end of the XVIIIth century, the yeomanry abandoned the land and concentrated in the towns. By 1830, agriculture as the key industry of European nations began rapidly to decline, and give way to manufacturing. The influence of this change was profound. For twenty centuries and more European nations and communities had depended on agriculture; each country was self-supporting, and being so was autonomous; commerce was almost entirely local, and foreign trade little more than an accident. During war time, as long as the enemy could be held beyond the frontiers, it was impossible to starve a nation into submission. To-day, what do we find? That no nation, except the most barbarous, is economically independent. This transformation, which was effected in less than a century, is beyond dispute the most stupendous in history.

Steam power changed the face of the world. In less than three generations it liberated the serf and the labourer, and has endowed both not only with citizenship but with luxuries and comfort formerly undreamt of by kings. As the cost of production fell, wealth unknown in any former age was accumulated, and went to finance machines and still more machines. Railways linked country to country, and steamships continent to continent. The introduction of iron vessels, in 1850-1860, revolutionised the price of navigation, and the general adoption of machinery compelled all industrial nations to exploit undeveloped lands, an undeveloped land frequently being synonymous with a country devoid of coal, or the power to purchase coal. Coal now became not only the driving force of peace but the backbone of war, though this was seen but dimly, if at all, by soldiers of this period. So important has fuel become in the world's life that, during the World War of 1914-1918,

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shortage of coal compelled Italy to abandon the Triple Alliance and side with Great Britain and France, and to-day, the dependence of France on English coal, and the dependence of England on American oil, definitely place war between the French and British and the British and Americans, outside practical politics.

Though between 1830 and the end of the XIXth century the entire structure of civilised society was changed out of all recognition, political theory and thought remained as they were before the industrial revolution set in. Governments, which are established for two main purposes, namely, the maintenance of law and order and protection against foreign invasion, became involved in economic problems which did not in fact concern the nation as a separate and individual unit, but as one of a group of units intricately set together in a single immense economic world-machine which depended for its smooth running and general utility on the maintenance of the law of supply and demand, which no one government could alone apply. To see that factories are properly managed, and that the workers are justly treated is the rightful duty of Government, but to interfere in world trade by the establishment of tariffs and econoimc frontiers are actions which affect not only the people of the country concerned but all nations trading with them. From internal philanthrophy to international economics is a step which cannot be taken by a single government without the risk of war, and war in the present economic epoch of world history is a totally different problem from what it was in the agricultural age of a hundred years ago. Then every civilised nation was self-contained and autonomous; but after the industrial revolution set in nations became economically interdependent. Government represented the nation, and the national point of view, but economics were international, that is they belonged to the world as a whole. Unfortunately for the welfare of the world the industrial revolution did not take place simultaneously in all countries. For instance, whilst Great Britain was fully industrialised by 1830, the main industrial epoch of Germany did not open until after the Franco-Prussian War. Up to 1870 Germany was virtually autonomous, and Great Britain largely dependent on other nations. Their outlooks were consequently different, but once they became similar a rivalry was established which was one of the main causes of the World War of 1914-1918.

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After the Napoleonic Wars, Germany, then an entirely agricultural country, turned to the doctrine of absolute war as practised by the great Emperor and preached by his high prophet, Clausewitz. In it she saw the clue to victory in future conflicts, and hemmed in as she was by powerful nations her position continued to be a precarious one. She was right in her decision as long as the economic world remained as it was, but so obsessed was she with the idea of physical force as the answer to all political arguments, that when Darwin, in 1859, published his *Origin of Species*, her leaders accepted his theory of survival through conflict, so applicable to the agricultural age, as their gospel of national progress. Not only did Treitschke and Nietzsche and others, draw their inspirations from this epoch-making book, but Karl Marx elaborated from it his system of social warfare as laid down in *Das Kapital*, which has formed the backbone of socialistic philosophy to the present day. As Delaisi says in his *Political Myths and Economic Realities*: "For the vertical division according to nationality was substituted the horizontal division according to class. Between the two internationals of rich and poor, the nations were eliminated. Peace could not be attained by the violent and world-wide suppression of one class by the other."

During the whole of this period what neither politician nor socialist could see, was that economic interdependence had become the law of nations, and that, consequently, political independence based on the idea of economic autonomy is a sheer impossibility in this industrial age. Had this been recognised, both would have seen that neither foreign war nor social war could solve economic problems, for warfare, whatever may be its nature, though it may cleanse a society and flush an epoch, can no longer render nations prosperous. To remove gold from the pockets of the rich and place it into those of the poor, or to remove the credit of one country and hand it over to another is no longer a possible solution to financial difficulties. When agriculture was the key industry all others depended upon it, and when each nation was self-supporting robbery was frequently profitable, but to-day, when industries are specialised, and every country depends on its neighbours, to rob another nation is to dislocate, if not kill, the source of one's own wealth. It has truly been said that "com-

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modities have no country," and Great Britain realising this has protected the frontiers of her vast empire far more effectively by her policy of free trade, than she could possibly have done had she doubled her navy and quadrupled her army. Free trade stands for universal peace, as no restraint is placed on the economic energies of any one nation by another. Conversely, protection stands for war because any modification of a customs tariff between two countries reacts upon all other countries. If a country grant to another favoured treatment and refuse it to a third, then to all intents and purposes an economic alliance is established, that is a coalition against the third party which to save itself from economic ruin may prefer to declare war. As an example of how international the world has become, when in 1920-1921 trade relations were hampered by the fluctuations in the rates of exchange, England was burdened with two million unemployed, the United States with three million, in Austria people were dying of starvation, whilst in Kansas and Dakota farmers were using corn for fuel as they were unable to sell it.

The Economic Foundations of the World War.

From 1870 to the declaration of the World War, forty-four years later, civilised nations lived in two worlds of thought—the political and the economic, and in the lack of harmony between these two is to be discovered the fundamental cause, or rather series of causes, which led to the declarations of war in August 1914. Political thought was founded on the agricultural conception of world power and economics were based on the mechanical conception, and the abyss between these two world theories was as great as that between the outlook of a farmer of 1814 and that of a locomotive driver of 1914. When two world ideas simultaneously possess humankind, such as Paganism and Christianity, Christianity and Mohammedanism, faith and reason, the divine right of kings and the infallibility of democratic majorities, Darwinianism and theology, agricultural statecraft and industrial, conflict is inevitable, and if sufficient people are interested, war to the knife is equally so. In the past every great ideal which has changed the progress of the world has been born in obscurity, nurtured by persecution, or opposition, and has attained its man-

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hood through war. After 1870 nationalism replaced the ideas of kingship and religion as *the* world ideal, an ideal so sacrosanct that should it be attacked, then it must be defended by the might of the nation to the last drop of its blood. Once it was the Holy Sepulchre towards which men's hearts were turned, to-day it is citizenship. It is inconceivable in the XXth century, should the Holy Sepulchre be destroyed by a heathen people, that Europe would rise in arms to rescue it. But let one European citizen be assassinated by a foreigner, then, unless the country to which the assassin belongs takes steps to punish the malefactor, a war-like feeling is at once engendered. The divine right of kings is no more, it has vanished into the limbo of the past, nevertheless it has been replaced by as stimulating an ideal—the divine right of citizenship, of country, of nation and of race.

Though long before 1914 the nations of Europe had become intricately internationalised, so much so that on the humblest breakfast-table might be counted the spoils of several continents, the conflict every government was preparing for was the old struggle between separate nationalities unconnected by any international idea. In a struggle between two nations the ultimate object is the overthrow of the enemy's political system, and not the destruction of his industries save incidentally as a stepping stone towards this ultimate aim. Such a conception of war was very different to the one which existed in the days of the idea of kingdoms; then booty, spoliation and annexation, far more so than political overthrow, were the objects of war. In 1702, to destroy Louis XIV, or to depose him, never entered the mind of the English Government, but in 1914, the aim of British politics was not only to remove William II, and all he represented, from the control of the German Empire, but, as events later on proved, to suppress his dynasty and the German national spirit. Nevertheless this object was nearly a hundred years out of date, for the World War was essentially a struggle between old political conceptions of world power, in a theatre of war in which this power had all but vanished in thin air. Further, the war was one in which every national vice was directed towards the destruction of every international virtue.

By the end of the XIXth century the technique of economic warfare had been fully established by the financiers and merchants

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of the great Imperialistic Powers, each of which made full use of its colonies and the markets it controlled to penetrate the trade defences of neighbouring countries. The overthrow of foreign governments was not the object of this conflict, far from it, for their overthrow would have adversely influenced trade. The outbreak of the World War in no way perturbed the United States of America until the Allies' blockade and the German submarine reply to it deprived America of her European markets. It was only then that the farmers of Kansas, the cattle raisers of Illinois, and the Jews of New York discovered that the Kaiser was the long-expected Anti-Christ. Formerly in the purely agricultural age, wars were duels between kingdoms and nations; to-day all this is changed, for henceforth between any two great powers conflict must inevitably lead to a world war, because all civilised nations, great or small, are in the grip of the law of economic interdependence, forming one vast and intricate international prosperity society.

Before the outbreak of the war and since its closure, this law has consistently been infringed by statesmen and politicians, because they have failed to understand that politics and economics, like oil and water, cannot be combined by shaking them together, and the more they are shaken the more chaotic does the mixture become. As an example, the consular service illustrates clearly this lack of understanding. Consuls of all great nations are officials concerned with private interests, consequently they should be attached to the department of the Board of Trade; in place they come under the Foreign Office, the excuse being that on occasions they have to intervene in the local courts of Justice. The real reason is that diplomatists have aggregated to themselves the duty of protecting commerce, and to do so have invested themselves with two incompatible functions: The one political, that is national, and the other economic, which is international. Thus, in 1914 (and still to-day), they possessed two means of waging war, namely, military attack and economic pressure. The first was a purely political weapon, the second was by rights no weapon at all, because it belonged to no single nation; yet, quite wrongly it was used as a weapon, for as Delaisi says: "Diplomats could be seen to use indifferently military pressure to obtain economic advantage, and economic pressure to obtain political advantage . . . . This fusion of

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the economic and the political occurred not only in the minds of the people, but in actual fact. It called for no surprise, then, if a Government, finding that economic pressure had failed, appealed to the verdict of the guns."

Up to the Franco-Prussian War the industrial revolution had been mainly a British development. After this war it became an European, and then a world problem, and directly it began to take effect, the guns were appealed to, and a war period was entered. The whole of the eighties were taken up by land grabbing and small wars. In 1894, Japan burst open the doors of China, and the United States of America went to war with Spain. Great Britain then quarrelled with the French over Fashoda, and in 1897 established herself at Wei-Hai-Wei; Russia seized upon Port Arthur, Germany Kiao-Chow, and France occupied Kwang-Chow. China was forced on the rack and compelled to open up her ports to European trade. In 1900, occurred the Boxer Rising which attempted to put an end to this *peaceful* penetration, and four years later the Russo-Japanese War was declared. Meanwhile, in order to protect and expand her interests in South Africa Great Britain waged a two and a half years war with the Boers, the Germans following suit in West Africa. Then came the Balkan Wars, the occupation of Tripoli by Italy, and finally the World War. Since 1919 the governments of nations have been arguing this way and that as to who was responsible for the war. The answer is obvious to anyone who understands the difference between politics and economics, or nationalism and internationalism, namely, there is no argument—all were responsible. It was the unhealthy state of Europe which caused the war, and, incidentally, had European nations been armed with broomsticks in place of rifles and guns, the war would have as inevitably been fought.

Turning to the more purely military side of this question: It will be found that the position of the soldier was as anachronistic as that of the politician. After 1870 the soldier, as a man of action, disappeared from history, and the administration of every country fell into the hands of economically-minded men. General Boulanger was the last of a discredited type which in former days had controlled the destiny of Europe. After Sedan soldiers became merely paid officials to protect the interests of bankers and financiers, and

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since then they have been denied a voice in all questions involving either peace or war. In the Middle Ages, when the Barons were inclined on robbery, they called to their support a number of spears. To-day their modern counterparts—the Bankers—do likewise, their spearmen being replaced by retainers armed with rifles and field guns. There is no essential difference in the means employed, but the end has vastly changed, for, whilst five hundred years ago to rob another man was definitely to increase the robber's wealth, to-day to rob another country is to kill the goose which lays not the national but an international golden egg. As the prosperity of peace depends on international industry, to destroy the wealth of another nation is to destroy one of the sources of wealth of one's own country. Yet again, if war is declared, and this wealth is not destroyed by military action, it will destroy itself through economic stagnation, or in other words by the interruption of the working of the law of economic interdependence. What the World War proved beyond a shadow of doubt is: That it was a war between rival industries, and it ended in a war against rival factories.

The war opened on traditional lines, so little had politicians and soldiers realised the economic changes of the preceding hundred years. Each government was under the illusion that it could impose its will on it's enemy's government as Napoleon had done, namely, by destroying armies in the field. Yet what do we see? Long before the war ended, the Allies were compelled to apply in full the law of economic interdependence. All resources in food-stuffs, armaments, ships, war material and credit were pooled, and controlled from London by an international dictatorship, without which the war could not have been won. By so doing each of the Allied nations abdicated its autonomy, for even the most visible signs of sovereignty—armies and high command—were eventually pooled and shared. The war had been declared in the name of the principle of nationality, and it ended in the formation of international armies, and finally decision was reached not by battle but by blockade—the economic and moral strangulation of the Central Powers. Never had a war of the first magnitude ended so unheroically; but, the student must remember, it was essentially a war of shopkeepers. During the agricultural period of civilisation, the causes of war were political; the object, normally—

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annexation of territory; the means—a war of movement and battles; and the consequences were purely national. In the industrial period in which we live the causes are economic; the object—the conquest of markets; the means—blockade and revolution, and the consequences are fiscal anarchy and prolonged economic crises, not patent to any one nation but to all nations of the civilised world.

The Future of World War and Peace.

The war once ended, a most extraordinary transformation took place, politicians and soldiers behaving as if they had just awakened from a Rip van Winkle sleep of over four years. No steps were taken to ascertain why the war originated, or how it was brought to an end. It might never have been fought, for, in 1919, politicians and soldiers turned a somersault and got back as quickly as they could to their political and military theories of 1914. Thus definitely was the war lost, not by this party or by that, but by the world in general. To the future historian of mundane affairs this somersault will be pointed out as one of the greatest crimes in history.

The peacemakers, with one exception, were ultra and violent nationalists, consequently totally unfitted to settle a most complex international problem. The exception was Woodrow Wilson, the President of the U.S.A. He wanted to mould the Old World on the lines of the American Union. Obviously this was impossible, because before a political league of Nations can be formed an economic one will have to be established; but America would not countenance such a suggestion—an economically consolidated Europe terrified her. In place of either a political, or an economic, league there was established a victorious oligarchy which aimed at the destruction of the industrial foundations of Germany through its instrument the vindictive treaty of Versailles. Worse still, the theory of the self-determination of races, a theory closely allied to the racial "freedom" idea of Bolshevism, rode rough-shod over economics and established a series of ethnographical frontiers which, being strategically untenable and industrially absurd, are standing irritants of war. If before the outbreak of the war, the Balkans had constituted an explosive area, the peace of 1919 extended this area to

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include the greater part of Europe. Europe was in fact Balkanised by the peacemakers, and new tariff frontiers were established forthwith. The question now arises: What of the future?

The predominant characteristic of the present age is that everything is in movement, the World may retrogress or advance, but for a while there would appear to be no likelihood of it standing still. The war shattered an epoch, and out of its ruins will either emerge a phœnix or a vampire. To attempt to federate Europe politically is out of the question, because the spirit of nationalism is as yet too strong for such an attempt to be made. Confederation is useless, for in the past confederation has always led to war, for example—ancient Greece and modern America. The only practical solution is to be sought in the fulfilment of the law of economic interdependence, that is through the law of the present age. Either Europe must willingly become an economic whole, or become a satrapy of America.

Before the war German trade penetrated every country; this was one of the fundamental causes of the war. In 1919, the Allies trod her underfoot, when at once the United States of America rose in her stead. In 1914, the only conceivable rival to America was Germany, to-day it must be Europe herself, and this can only be accomplished by Europe becoming an interdependent economic whole, as the Allied Powers were during the last year of the war. Fortunately for Europe the rigid tariff wall of the great Republic, has so far prevented European nations establishing large credits in America, and until they do so the United States cannot flood Europe with her goods. To-day she possesses the bulk of the world's gold, but until it can be circulated throughout the world, as Persian gold was by Alexander, and Indian gold by Clive, it is but impotent metal. Again, as Ramsay Muir says in his book *America the Golden*: "Just as the Napoleonic War gave to England a lead in steam power so the Great War has given to America a similar lead in the use of the new forces of to-day" (oil and petrol). In time the Americans will discover that the policy of high protection is detrimental to their economic interests, and already European nations are alarmed at the possibililty of American free trade. The only alternative to American dominion over Europe is for European nations to establish what may be called an economic

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papacy, that is an Economic League of European Nations, ready to expand into a World League directly free trade is adopted as a universal principle. The dry rot which destroyed the power of the Papacy of the Middle Ages was the amalgamation of spiritual and temporal power. So in this new papacy, this Economic League, must political power be separated from economic, or else industrial wars will rend European Civilisation to pieces, just as religious wars did until the spiritual and the temporal were separated. Had this been realised in 1919, the Peace of Versailles might have been a second peace of Westphalia, the saddest thing for Europe is that it was not.

Whether Europe is to command her own destinies, or obey the will of America, the end would appear to be much the same, namely, the economic consolidation of the civilised world, and a return to the Cæsarism of the first century of the Christian era. Money in the future, as in the past, will move towards the centres of exchange, and as long as London remains the financial centre of the West, Great Britain will hold the reins of peace and war in Europe. It is not disarmament which will stabilise peace, but financial control. Weapons are means of waging war, but they have nothing to do with its causes which one and all can be traced to the diseases of peacetime society. The main cause of war to-day is industrial rivalry, and when the financial Cæsars of the coming age obtain control, these rivalries will disappear through economic centralisation. The old theory of the balance of power will be replaced by the new theory of the balance of trade, for wars can no longer render nations prosperous, and the commercial spirit is antagonistic to war.

The influence of these changes on military organisation will be profound. The economic world oligarchy will in idea be far removed from that of present-day democracy. As ever will the people have to be kept obedient through fear by those who in the world order represent greed. For such a purpose the democratic infantry armies of to-day are useless, and they are likely to be replaced by small forces of highly paid mechanised Prætorian Guards, against which the people will be impotent. Foreign wars will die out because only the greater industrial nations will be able to wage them, and for these, obviously, it will not be to their

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advantage to do so, because their true rulers will be the capitalist oligarchs. The tank and the aeroplane are in very nature the ideal weapons of a police force, for they render the attack overwhelmingly superior to the defence, a condition of war which though it existed during the XVIIIth and XIXth centuries, so rapidly declined in the XXth that the national infantry forces of 1914-1918 were totally lacking in offensive power. In fact the day of their reckoning was even then at hand.

Does this mean that wars will cease, and that the millennium is about to be manifest? Not necessarily, for the approaching age is likely to reduplicate the last four centuries of Roman rule. If it is correct to say that wars are symptomatic of social diseases, wars will only cease their troubling when society becomes perfect. That such a state will ever be reached in this world is unlikely, consequently if economic perfection eliminates foreign wars, unless simultaneously society becomes morally perfect, civil wars and revolutions will continue. The establishment of a new nobility based on greed—the financial oligarchs—and the transformation of democratic rule into the government of a plutocracy will probably engender a new priesthood which will oppose it, and instil into the hearts of the people the old terror under a new name. To-day we see such a development in progress. Communism may possibly be the beginning of a new religious creed, for in Russia it has developed into a spiritual force, that is a weapon which can attack the soul and not only the body of man. If Russia, as she may well do, turns from fear to greed, as the Papacy did during the Crusades, her power will vanish, but to-day she is waging a war of the Word, just as the primitive Christians did, and her means of attack are internal disorder and revolution. The Roman Empire was destroyed not only by the barbarians without her frontiers but by the underworld within her bowels, an underworld begotten by a corrupt and shortsighted financial policy, and one so bereft of the joys of this world that the scum of Rome was willing, even eager to die for the next—a desperate and awe-inspiring brotherhood. To-day Europe is confronted by Russia and Asia, industrially barbaric countries, and within her bowels is consolidating an underworld begotten of the diseases of civilisation. If the fevers engendered by these diseases cannot be thrown off in the form of foreign wars,

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then they will take on the form of revolutionary conflicts. Such may quite possibly overthrow Western Civilisation, as fifteen hundred years ago the civilisation of Rome was overthrown. The destiny of the World is in the hands not only of her "nobles" but of her "priests," and mankind must alternately be stretched on the rack of war and broken on the wheel of rebellion, until these two establish a harmony between fear and greed—the spiritual and the mundane.

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BELLEISLE. 1761.

By Major-General J. C. Dalton, Colonel Commandant, R.A.

PART I.

Retrospective.

In the Journal of the Royal Artillery, January 1929, we dealt with the Siege of Louisbourg 1758 and Capture of Quebec 1759 which brought into the limelight two outstanding leaders, viz.: Major-General Jeffery Amherst (the future Field-Marshal Lord Amherst) the final conqueror of French Canada in 1760; and the immortal Wolfe who gave his valuable life at Quebec, September 1759.

As we stated in the above-mentioned article, the prime mover towards the increased military activity of Great Britain and the inauguration of a more spirited foreign policy than had been evinced during the lethargic and vacillating Newcastle régime, was William Pitt, later first Earl of Chatham. His patriotic energy took the form of an increased army, and many overseas expeditions, naval and military, against the French—not all as successful as those above quoted—were despatched from the shores of England.

The exigencies of the "Seven Years War" (1756-63) entailed severe fighting on the continent of Europe simultaneously with the events in Canada. Col. Duncan in his history of the R.A., Vol. I, relates how by the Treaty of Aix-la-Chapelle of 1748, Silesia had been annexed to Prussia; and Austria, in order to regain that province, organised a powerful coalition against Prussia by means of an alliance with Russia, Saxony and Sweden. Great Britain, on account of Hanover, threw in her lot with Prussia, and France eventually joined Austria.

Pitt's policy had been to keep France well occupied in Europe and thus weaken her force in America, and, no doubt, that had been so far successful. But, as Fortescue says, "Pitt spoke but half the truth when he talked of conquering America in Germany;

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it was not only America, but the East and West Indies—in a word, the British Empire." [1]

England had begun badly in 1756 by losing Minorca to the French, on April 8th, and though a threatened invasion of Great Britain never materialised, France took Hanover from us in the same year.

We have described in the previous article how the disasters to Braddock's and Abercromby's forces in North America in 1757 were amply avenged at Louisbourg in 1758 and Montreal in 1760, in addition to the brilliant successes in East and West Indies.

Duncan truly says—"It was a wonderful time—a time bristling with ubiquitous victories, a time teeming with chivalrous memories . . . ."

Simultaneously with Wolfe's operations against Quebec, ten thousand British troops were about to invade Germany under the gallant Prince Ferdinand of Brunswick, and on August 1, 1759, the glorious victory of Minden further swelled the tide of British successes and immortalised for the R.A. the names of W. Phillips (153) and Forbes Macbean (120).[2] The Royal Navy under Boscawen, Hawke and others also contributed to Britain's splendid record on the sea.

King George II just lived to rejoice in the British successes, and it is not surprising that when—in the late autumn of 1760—King George III opened parliament, the enthusiasm of a grateful country was such that she willingly voted a large augmentation to the army in order to reinforce Prince Ferdinand in Germany, and we are told by Fortescue that early in 1761 the British infantry was increased to 96 regiments.

Meanwhile Ferdinand had been successful on July 16, 1760, in the brilliant affair of Emsdorff where the British with their German allies defeated the French—an action in which the XV Light Dragoons had their *baptême de feu*—"the amazement of the whole army"—which gained for them the proud distinction of bearing "Emsdorff" on their appointments. This success was to be followed up at Warburg on July 31 where the British artillery—according to Tempelhof—surprised the whole army by

[1] "History of the British Army." Vol. I. Chapter XVII.

[2] Figures in brackets after names of R.A. officers refer to their "Kane's List" numbers.

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its great mobility when supporting our cavalry in pursuit of the French under De Muy, by galloping into action! These successes were, however, damped by a bad British reverse at Kloster Kampen, October 16, where again the XV saved what might have been a serious disaster by efficiently covering the retreat. The allies lost 1200 killed and wounded and 1600 prisoners. The enemy's loss was very heavy. The Hereditary Prince of Prussia, who was in command of the allies, ungenerously blamed the British for this failure but French historians do not bear this out;[1] he managed to extricate himself but had to retreat into Westphalia and was able to detach a small force to go to the assistance of his ally, Prince Ferdinand. The latter having failed to get the French out of Göttingen went into winter quarters at Warburg, the French doing ditto in Cassel. Here we must, after this digression, leave them, and *revenons à nos moutons!*

Pitt had his own scheme for helping Ferdinand by diverting the attention of the French to their own country and decided as early as January 1761 on the despatch of an expedition against the French coast—the destination being kept secret. As we shall see presently in Part II the destination was Belleisle, a fortified island in the department of Morbilan, 8 miles S. by W. of the peninsula of Quiberon. The island had an area of 33 sq. miles and was chiefly moorland and agricultural with an extensive pilchard fishery. The country is a treeless plateau, the average height above sea level being 130 feet; it has a rugged and broken coast and was then dotted all over with small farms. After France lost Nova Scotia, many of the inhabitants emigrated to Belleisle where they settled.[2]

PART II.

Siege of Belleisle, 1761.

The strategical value of this island consisted in its covering Port Louis and the mouth of the River Loire. Porter[3] describes it as affording a protected position, under the guns of the fortress,

[1] "Fortescue," Vol. II, p. 518.
[2] See "Beatson's Naval History" 1804. Vols. II and III.
[3] "History of the Royal Engineers," Vol. I.

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to the numerous privateers which were a menace to British merchantmen in the Channel. For an accurate description of this siege historians have had the advantage of a valuable MS. diary in the possession of the Royal Artillery Institution, Woolwich, entitled *Account of the Siege of the Citadel of Belleisle. By an Officer who was present at the Siege, 1761;* and many, including Duncan, Porter, etc., have freely used it in a greater or less degree.

I propose to indent on this diary—which, by the way is generally attributed to Brigadier Thomas Desaguliers, R.A.—and to notice several details which Fortescue and other authors have doubtless omitted for want of space. Duncan, commenting on the fact that the expedition had been in course of preparation for some twelve months for an undivulged destination, shrewdly observes—writing in 1872—that in 1760 there were no licensed newspaper reporters or interviewers, and "inquisitive M.P's had to content themselves with very evasive replies." We wonder what he would have said had he been writing 50 odd years later!

Duncan's comments—always trite and well expressed as well as wonderfully sound—regarding this expedition are worth quoting, though necessarily much condensed. They were extraordinarily true and apply equally to England in her subsequent campaigns and wars, right up to the "Great War" (1914-18).

"The English nation has characteristics which are displayed at every stage of its history. Lavish during war in order to gain its ends, it is disposed to be penurious during peace, and the favourite stalking-horse to power then is a profession of economy . . . . It may be said that as a nation the English sink political differences during war and show a union almost peculiar to themselves. The only case in which war and political differences existed simultaneously, to any great extent, was during the American War of Independence—the reasons were then exceptional, the result, fatal." [1]

We learn from the "Diary" that the Fleet which left Portsmouth on March 29, 1761, under the command of Commodore The Hon. Sir Augustus Keppel—a name honoured in the British Navy for generations—consisted of 11 ships of the line with 8 frigates and 2 fireships, 3 bomb vessels, 64 transports with troops, 4 store

[1] "History of the Royal Artillery, Vol. I, p. 227.

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and baggage ships, 3 bomb-tenders, 4 hospital ships, 15 victuallers, 5 ordnance ships—in all 95 sail—also 50 flat-bottomed boats to carry 60 men each. The fleet comprised 10,000 men. Six frigates were detached to cruise between the island and the mainland.

Major-General Studholm Hodgson was in command of the troops of the expedition. The Regiments of Infantry consisted of the 9th, 19th, 21st, 30th, 67th, 69th, 85th (5 Co.s), 2 battalions of Independent Companies and, from Ireland, the 76th and 90th; also a battalion of Marines under Lt.-Col. Mackenzie.[1] The Artillery was under Colonel Thomas Desaguliers, a highly scientific officer, who arrived off the island on April 12th—five days after the fleet—with Captain R. Hind's Company of Artillery from Portsmouth, and took over command of the R.A. from Capt. A. Tovey which then consisted of his Company and the other R.A. details with the fleet; also 70 Miners under Capt Muckell, R.A. Desaguliers was appointed Brigadier on April 14th and he made Capt. Lt. Stehelin his Bde. Major. The total strength of the army was 8339 effectives. The bomb vessels with the fleet absorbed some R.A. officers (of whom later). There were also 11 officers R.A. with the detachments for battalion guns.

The fleet had anchored off the coast of the island in the Bay of Palais on April 7th, and bombarded the fort. Next day it landed a small body of infantry in flat-bottomed boats near Port Loc Maria in order to storm some French entrenchments. This entailed climbing up a very steep cliff, and only 60 men of the 67th Regt. under Capt. Osborn are reported to have reached the summit. No doubt the rest followed, but were overpowered, and the remnant had to beat an ignominious retreat to the boats with considerable loss.[2]

On April 14th Brigadier Desaguliers together with Major Bramham, Chief Engineer, made a trip up the coast to note possible landing places.

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[1] The rest of the force viz., 16th L.D.; 3rd Buffs.; 1½ Battns. of 85th; 36th, 61st, and 75th appear later, as they joined, also the 97th, and Beatson gives 98th (Lt.-Col. Stuart). None of the regiments in this campaign bear "Belleisle" on their colours.

[2] Accounts vary as to this reverse. Duncan says that the landing party consisted of 300 men, and that the losses were 37 killed and 76 wounded and prisoners. Smollett in his history of England, and Fortescue, put the loss at 500 killed, wounded, and prisoners. The "Diary" however, states that Lt.-Col. Thomas, Q.M. Gen. was wounded, 21 men killed, 40 wounded, and 2 officers and 50 men prisoners. I should be inclined to back the "Diary"!

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On April 22nd, the great storm of April 13th having sufficiently abated, the C.-in-C., warned by the recent failure, decided—following the example of Louisbourg three years before—to make feints against Loc Maria (Ste. Foy) under Genl. Lambart, and Sauzon, and launch the real attack against the coast at Port d'Andro, a wild and rocky spot not far from the site of the landing of April 8th. Accordingly General Crawfurd's force, covered by a brisk fire from the fleet, effected a successful landing at the above point. The enemy was surprised and fled, leaving 5 brass guns on the field, and the British formed up on the high ground. Fortescue describes this as "a brilliant affair," the 19th Foot having specially distinguished itself. The Navy co-operated on shore with a body of 1400 Marines under Lt.-Col. Mackenzie who, having been wounded, was replaced by Capt. Collins who was given the rank of Major.

The enemy lost 60 killed, and the British 30. Lord Pulteney and Major Skinner are mentioned in the Diary as having been the first to reach the summit. The whole British force landed that night and advanced towards the Citadel of Palais, the capital of the island. The French retiring destroyed the roads.

The following Commanding officers landed: Major-Genls. John Crawfurd and William Rufane; Brigadiers H. Lambart, Guy Carleton and Hon. W. Howe; Lt.-Col. Sir T. S. Wilson, Bt., Adjt.-Genl.; Lt.-Col. Lewis Thomas, Q.M.-Genl.; Capt. A. Tovey, R.A., and Major Bramham, Chief Engineer.

Brigadier Desaguliers was able to land from 5 vessels a quantity of ordnance and stores which according to the "Diary" consisted of eight heavy 24 prs. with 2400 rounds, six medium 12 prs. with 1800 rounds, fourteen light 12 prs., four 8 in. howitzers, two 4½ in., two 10 in. and four 8 in. mortars, the latter with 1000 shells. Also five pontoons and 416 barrels of gunpowder. No horses for the artillery had yet arrived. On April 23rd the army encamped at the village of Merezel, a mile or so short of Palais.

The last batch of troops just arrived from England attempted to land two companies of R.A., some light horse and field pieces but a storm came up and interrupted the operation, leaving the few who had got on shore without tents or food. This unfortunate delay enabled the French to proceed with their defence works

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without serious opposition, and they now prepared to resist a regular siege.

On the 25th the C.R.A. and C.E. managed to land six field pieces and two royal howitzers near the village of Casparus, just under a mile from the Citadel, and 1260 yards from the enemy's advanced redoubts. The British seized and entrenched the village of Bordelins but were shelled out, and abandoned it after setting it on fire. It was christened the "Burnt Village."

On the 26th in a skirmish, Major Sir William P. Williams, 85th, was killed. On the 29th the artillery horses were landed and progress made in landing the heavy artillery. The guns and horses were then distributed. Palais, the only real town in the island, was strongly fortified on the Vauban system and preparations were now begun for a deliberate investment.

On the 30th April the R.A. was augmented by one captain, three subalterns and 30 men from the bomb ketches. We propose now to give the names of all the Artillery and Engineer officers who took part in the operations. They have been carefully culled from Kane's List, Duncan and the R.E. List and amplified and corrected by the "Orderly Book" kept at Belleisle, 17 November to 26 December, 1761, of which a copy has kindly been lent me by Lt.-Col. J. H. Leslie. viz. :—

Officers R.A.

Brigadier Thomas Desaguliers (Commdg.) (51).

Captains A. Tovey (92); R. Hind (138).

Capts. Lt. B. Stehelin (161) (Bde. Major); G. Groves (187); P. Martin (231); T. Jones (225); E. Williams (268).

Subalterns J. Wilson (220); Elers Walker (222); L. Forman (158); R. Rogers (243); J. Scott (202); T. D. Pearse (303); Lachlan Shaw (306); J. Brietsche (311); Archibald Mitchell (319); J. Gowan (366); N. Kindersley (328) (Adjutant); J. Turner (367); J. Schalch (368); R. Lawson (369); A. Mackenzie (371); S. Parry (382); D. Rosette (390); C. Skottowe (397); J. Mayne (486); Lachlan Cuthbert (379).

Total, 28 R.A. Officers in all.[1]

[1] Duncan says there were 37 R.A. officers but the existing records do not support this; it is probably a misprint for 27.

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Officers of Engineers.

Major J. Bramham, Chief Engineer.
Capts. Matthew Dixon and John Archer.
Capts.-Lt. Thos. Walker[1] and T. Wilkinson.
Lieuts. T. Lefanu; H. Watson; H. Morse; J. Heath.
Ensigns Elias Durnford; W. Green; A. Mercer; G. Townshend; W. Tolly; G. Ritso.
Volunteer W. Muller.
Total 16.

On May 2nd a good position was taken up at the village of Kergayet, 1930 yards from the citadel. The Light Horse landed and were told off to escort the R.A., but the horses would not face the fire; the guns, however, held on unsupported to within 700 yards of the enemy, opened fire and dislodged him. The next day General Crawfurd and his A.D.C. blundered into the enemy in the darkness and were made prisoners—a serious loss to the British.

On May 5th the British infantry strength is put down at 6250 in three Brigades of equal size which formed the daily guard of the trenches.

On May 6th the mortar battery of 15 pieces did good execution against the "Cavalier bastion" at 1100 yards. Some sea service mortars were landed from the fleet. The gunners suffered several casualties to-day.

On May 7th the Diary states that the Prince of Orange, who was with the fleet, stood in with the bomb ketches but did no execution owing to the gunners having been sent on shore!

From this time on it was evident that Brigadier Desaguliers was taking a very prominent part in the siege operations, and great confidence was reposed in the artillery. Port Halan was occupied by a strong guard of 400 men, and four 6 prs. were sent there.

The Diary for May 9th announces reports of a large force on the mainland some 7000 strong, ready to reinforce Belleisle. This was probably a *ballon d'essai*, for nothing had come of it! The enemy's fire did much execution on our parapets and we retaliated by firing "pound shot" from mortars.[2]

[1] Died at Belleisle, 1762.

[2] This was a device imputed to Brig. Desaguliers.

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On May 11th our troops occupied Port Kerel behind Bangor village on the opposite side of the island. Deserters from the French gave information as to the hour for relieving guard, and our mortars and howitzers annoyed the enemy by occasional fire. Ammunition was running short and Brig. Desaguliers asked for a further supply—also for two more infantry companies to reinforce the trenches.

On the 13th we had seven batteries in action, mounting 40 mortars and 24 guns and on this day the British made a determined attack on the French position before Palais. Of the detachments manning the two field guns—16 in number—two were killed and seven wounded. Lieut. L. Cuthbert, R.A., is specially mentioned for gallantry by Beatson and as being in command. Our attack was pressed home, the enemy losing six redoubts and some batteries, and were driven into the Citadel with considerable loss. The French Commander sent a parley to General Hodgson imploring protection for the civil population. This was readily agreed to on the condition that the French troops should be withdrawn into the Citadel, which they were.

The British had now obtained a commanding position 400 yards from the Citadel on which they started their second parallel and fixed sites for breaching batteries. French prisoners described our fire as *un feu d'enfer*, "blotting out heaven and earth" and whenever the townspeople of Palais saw an artillery officer they shouted "*Gare la bombe!*" The redoubts and forts taken from the enemy were now occupied by a British force of 92 officers and 2300 men. Capt. Tovey, R.A. was placed in command of the batteries in the trenches, another R.A. officer of the artillery in the town, and a third of the R.A. in Port Halan and advanced posts.

General Crawfurd, who was a prisoner in Palais, officially reported to General Hodgson that the British prisoners were quartered in a house in the Citadel where they were directly in the line of fire of the besieging force. Colonel Burgoyne of the cavalry was sent across to the mainland where he obtained an interview with the French commander, the Duc d'Aiguillon, who instantly sent orders to M. du Croix to have the prisoners moved to a safer place, which was done.

On May 14th Capt. Muckell, R.A., who commanded the com-

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pany of Miners (and had been wounded only the day before), proposed that a mine should be laid under the Rédan du Havre. Careful and detailed orders were given by Gen. Hodgson for the protection of the inhabitants "either in town or country," and nothing was to be seized without his authority under pain of punishment.

On the 15th ten 32 pr. iron guns were landed for arming the 2nd parallel, working parties of infantry being detailed and to be paid as matrosses. Another battery of 20 mortars opened this evening. To prevent drunkenness amongst the soldiers on duty in Palais, the Provost Marshal was ordered to live there and was given authority to hang without trial the first soldier found drunk "as soon as he became sober." We are not told how many—if any—were thus dealt with!

Duncan relates how unpopular the trench work was with the infantry working parties, notwithstanding that they got extra pay. "They did not dislike idling and loafing about the trenches but shirked the spade work." An order was issued by the C. in C. on the representation of Brigadier Desaguliers "that any Artillery officer finding a man near his post idle or curious was to lay hold of him and make him work for 12 hours." Evidently "ca' canny" is no new disease! The Mayor of Sauzon was warned that if he allowed his inhabitants to "skulk" along the coasts he and the town "would suffer military execution." On the 19th siege operations against the Citadel were in full swing. The fleet was unable to comply with the demands for war material, and it had to be sent for from England. Horses and forage were now collected from the country and 24 pr. guns were especially asked for from the fleet. On Brig. Desaguliers reporting that "the constant rains had floated the magazines in the trenches," an order was given that all hides of cattle killed for the troops were to be sent to the Artillery, and any soldiers not on duty coming to the trenches were to be "laid hold of and made to work for 12 hours."

On the 23rd May the "new battery" on the 2nd parallel was opened; it mounted ten 32 prs. and six 24 prs. Lieut. Mackenzie, R.A., and several men were wounded in this battery. Work now went on steadily and is daily recorded in the Diary. The R.A. were evidently hard pressed for men to work the guns for they

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applied for seamen from the fleet, but they could not be spared.

Capt. Lt. E. Williams was placed in command of the mortar batteries and was given help from the infantry. The working parties got a daily allowance of one gill of spirits.

On May 26th a heavy fire of shells and carcasses was directed against the citadel, the fleet joining in. The weather was very inclement and the trenches so wet that the ammunition suffered and hauling the guns was difficult.

On the 27th a French woman was seized coming out of the citadel with a large bundle of letters. "She pretended to be laundress to the 'Trésorier,' and was sent to the Provost with a rope round her neck." We can but hope that that official did not take the hint, and that she was only *quitte pour la peur!*

The C.R.A. again applied for 400 men to help the Artillery who could not get enough rest. As this could not be granted the night duty was reduced. The Miners started to-day to mine under the "ditch" which was wet at high water.

On the 28th an enemy shell blew up a British magazine but with only slight loss of life. To-day the 36th. Regt. and the other half of the 85th Regt. arrived from England with two officers and twenty men R.A., in charge of two field pieces, and next day the 3rd Buffs and two more R.A. officers and four field pieces arrived—a welcome reinforcement. Heavy "battering in breach" continued. On June 1st the 75th Regt. arrived and a new battery of two 24 prs. was opened. This battery was under fire on the following day and Brig. Desaguliers was wounded, the enemy being very active and doing a good deal of damage. Brigadier Howe and Capts. Muckell and Williams, R.A., were wounded, the second named for the second time, and mortally. The 2nd battalion of the 85th, 440 strong, arrived to assist the C.R.A. The enemy on June 4th was reduced to firing wooden projectiles. On the King's birthday (to-day) a Royal salute of 93 shelled guns was given ! On the 6th Capt. Tovey was in command of our 16 and 10 gun breaching batteries at a range of 250 yards. The end of the siege was nearing, and no wonder !

June 7th was a memorable day. The Diary gives details of all the batteries—100 pieces—in action against the devoted fortress. The breaches were declared practicable and all ready for the assault.

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But, with a humane wisdom, which did the brave French commander credit, he did not wait for further bloodshed, but hoisted a white flag under which parlementaires came out to make terms which were drawn up by the two sides, and envoys returned with them to their chief. By 6 p.m. the Articles of Capitulation were signed by Gen. Hodgson, Commodore Keppel and Chevalier du Croix, and a British guard of a captain and 50 grenadiers entered by the gate. The occupying force included Capt. R. Hind, R.A., with Capt. Lt. P. Martin and Lieuts. Rogers, Rosette, Skottowe and Mayne. Brigadier Desaguliers at once gave orders for a "remain" of all ordnance and stores to be taken.

So ended a simple and well-organised campaign signalised by a thorough co-operation between the sister services, carried through in the face of many difficulties against a brave enemy, with but slender loss of life on either side, and with a chivalry between the opponents worthy of the days of Fontenoy.

The Articles of capitulation are given in the Diary *in extenso* in both languages. They are straightforward and equally honourable to victors and vanquished. The latter were allowed to march out with the honours of war, colours flying, lighted matches and 15 rounds in the cartouche box of each soldier. The inhabitants were considerately treated and vessels were found to transport the French troops to the nearest port and victualled as for the British. The brave French commander, du Croix, and certain superior officers were to be conveyed at once to Nantes with their wives and families.

The religion of the inhabitants was to be respected; the sick left in hospital would be cared for as our own. On the signing of the Articles, the British prisoners were at once released and the French prisoners were to be dealt with according to the *Cartel de Sluys (L'Ecluse)*.

On June 11th the Governor and French garrison embarked in British transports under salutes fired from the trenches by Brigadier Desaguliers, the British troops being under arms.

The Diary remarks that the fortress had been twice before attacked but not taken; it now fell to the British 46 days after landing and 36 after opening the trenches.

The old question of the right of the Royal Artillery to the church bells of captured towns as its perquisite came up on this occasion.

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The Rector of the parish of Palais wrote to Brigadier Desaguliers on June 16th, pleading the great poverty of his parishoners and the absence of any revenue, and begging that the church bells, which were the only means for summoning to worship the inhabitants of four parishes, including Palais and Sauzon, might be spared. The Diary gives the Rector's letter in full, and it is pleasant to read that, being touched by this pathetic appeal, Brigadier Desaguliers, whilst feeling it his duty not to forego this old-established right, accepted the offer of the priests to give him a lump sum in lieu of the bells, which had been subscribed for by the four congregations, and which amounted in all to the modest sum of about £120.

The subject of this old-time privilege has been dealt with by Duncan in his Vol. I, and as a matter of history it seems worth while briefly to notice it here because it seemed to have been given a quietus by the British Government in 1809, in connection with the claim by General Macleod, R.A., after the capture of Flushing. The question was referred to our Government who decided in favour of the inhabitants. Duncan deals fully with this and it was also mentioned by the present writer in a paper published in the Journal of the Royal Artillery, July 1926, entitled "A Gallant Fiasco."

Looking at this matter with modern eyes, one is bound to sympathise with the unfortunate inhabitants who, as a rule, are not in the quarrel, and, in the case of Flushing, did not even belong to the nation which had occupied their country and was at war with England.

At the same time, the correspondence on record between the Officer commanding the Royal Artillery and the civil authorities—in the cases of Flushing and Belleisle—does credit to their humanity and sympathy, and we cannot but admire it—especially bearing in mind what war was in those days—for being jealous of the old and time-honoured, even if somewhat barbarous, custom of war which gave rise to this special privilege of the Artillery of a victorious army.[1]

[1] At the moment of penning the above words, the writer received the January number of the "Journal of the Society of Army Historical Research" in which a correspondent quotes from an article of Nov. 1911, published in the R.M. Academy Magazine, the writer of which remembers seeing the parade at Woolwich of the contingent of Royal Artillery who had returned from the Crimea, and states that the captured Russian guns *and Church bells* were arranged in rows extending from the Arsenal to the river Thames! This looks as if the year 1809 did *not* mark the last occasion when Church bells were taken after a victorious campaign.

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The Diary terminates with a succession of tables that must have involved elaborate and laborious work which though interesting and curious, it is neither necessary nor possible to do more than comment on.

From a perusal of them, we are able to realise the careful administration and staff work of the campaign by General Hodgson and his able subordinates, amongst whom by no means the least trusted was Brigadier Thomas Desaguliers.[1] General Hodgson's colleague and co-Commander-in-Chief, Commodore Hon. Sir Augustus Keppel, R.N., co-operated admirably with him, and their friendly inter-communication undoubtedly ensured the success which crowned this expedition.

It is evident that matters were much expedited by the nearness of the base at Portsmouth and, above all, the command of the sea. Reinforcements both of personnel and munitions of war were therefore easily obtainable. As regards the history of the land force of the expedition after the capitulation we know from the "Orderly Book kept at Belleisle 17 November to 26 December 1761" the orders to the Army of Occupation during the above dates, and from it we gather that General Hodgson remained in the island till the end of the year and left Major-Gen. Crawfurd in command, who had as his Adjutant General Lt.-Col. Sir T. P. Wilson, and his C.R.A. (after the departure of Brig. Desaguliers and Capt. A. Tovey) was Capt. R. Hind who had under his command Capt.-Lt. P. Martin, and the following subalterns, R. Rogers, L. Shaw, D. Rosette, C. Skottowe, A. Mitchell (who commanded the miners) and J. Mayne; also A. Mackenzie who had exchanged into the Company with J. Gowan.

Of the Engineers Lts. Lefanu and Mercer remained. There was also left a detachment of the 16th L. Dragoons for cavalry and escort duties.

The following battalions of Infantry remained with General Crawfurd on the island, viz. : 3rd Buffs, 67th, 75th, 85th (2nd Battn.) and 97th—in two brigades. Brigadier Howe was appointed Lieut. Governor. Elaborate rules and regulations were made for the repairs of existing defences and creation of new ones and for a supply of horses for the movable armament, etc.

[1] Died in 1780 as a Lieut.-General and Chief Firemaster since 1742. He was the first Royal Artillery officer to receive the honour of a Fellowship of the Royal Society.

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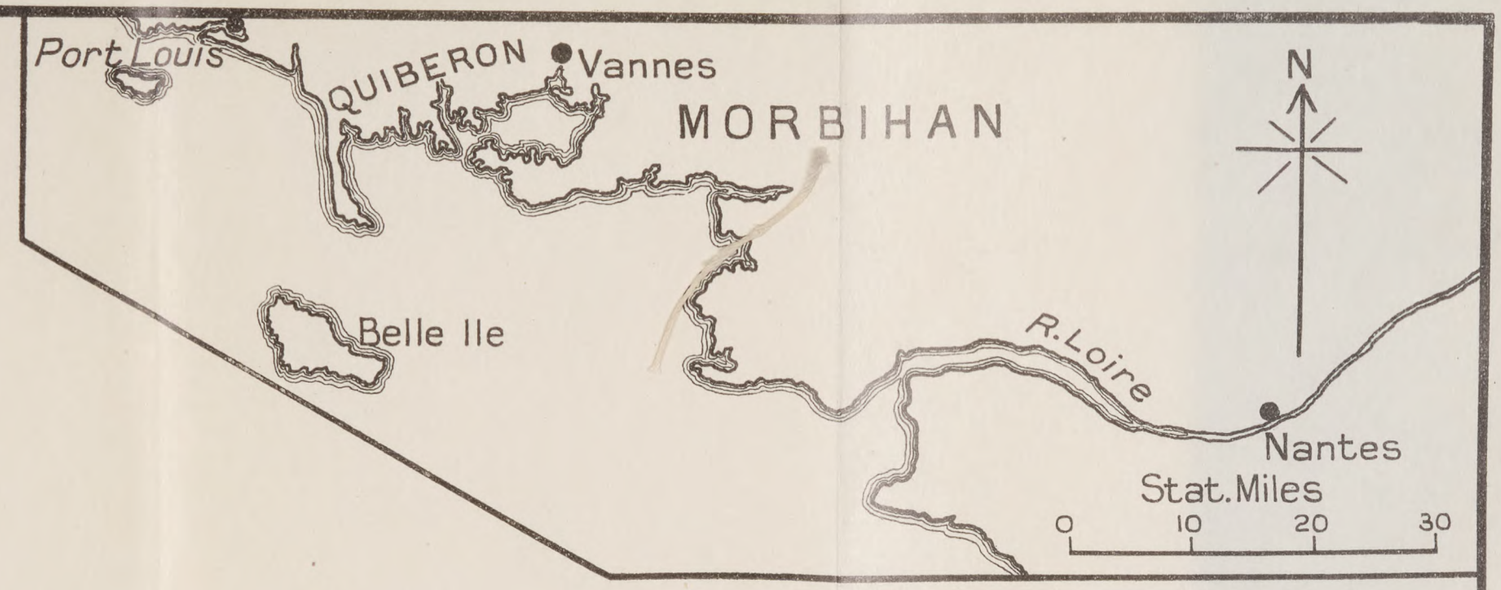
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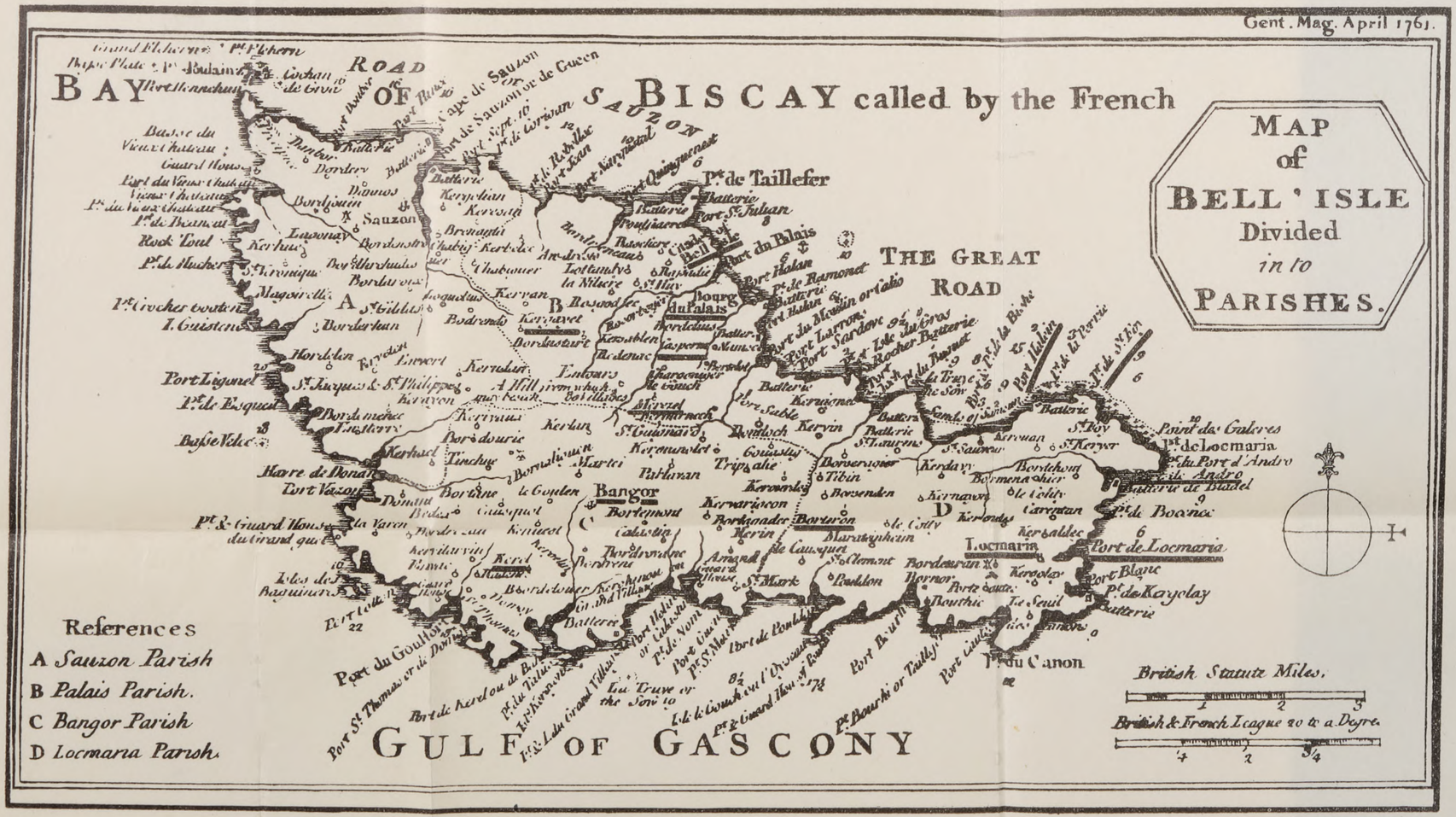
Gent. Mag. April 1761.
MAP of BELL'ISLE Divided in to PARISHES.
BAY OF BISCAY called by the French
ROAD
SAUZON
Pt de Taillefer
THE GREAT ROAD
Bourg du Palais
Bangor
Locmaria
Port de Locmaria
Port Blanc
Pt du Canon
GULF OF GASCONY
References
A Sauzon Parish
B Palais Parish.
C Bangor Parish
D Locmaria Parish.
British Statute Miles.
British & French League 20 to a Degre.

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The late Lord Wolseley in his famous "Soldier's Pocket-Book"—a classic text book for many years—remarks *re* "Correspondence"—"The Artillery in particular seem to revel in complicated returns." The present writer, who remembers the book well, was quite prepared at that time to agree with the distinguished author, but after perusing the "Diary" of Belleisle he realises that over a century later we were not in it with our forbears of 1761 so far as "complicated returns" went!

As regards casualties, the R.A. came off lightly with 7 killed and 34 wounded, which included one officer killed and 4 wounded.

Of the "Additionals"—viz.: the Infantry attached to the R.A. under R.A. officers—4 detachments under Lieuts. Brietsche, Wilson, Parry and Schalch had 7 men killed.

The Infantry lost 282 killed and 533 wounded out of their 14 units, and the Navy had 41 killed and 408 wounded (presumably including the Marines). On the 23rd September the R.A. effectives numbered 31 officers and 389 men.[1]

By December 30th the force had left for England, except those we have mentioned above as the Army of Occupation. Belleisle was held by the British till restored to France at the general peace of Paris, 1763. By this treaty England retained all conquests in North America and India, recovered Minorca, Florida and Louisiana, but restored the Havana, Belleisle, Martinique, Guadaloupe and St. Lucia.

Notes on the Map.

The date of the map is contemporaneous with the campaign. The original appeared in the "Gentleman's Magazine" of 1761.

As it is covered with names which are not connected with the text, the few which are mentioned in the letterpress have been distinguished by underlining.

The "Citadel" corresponds to the "Castle of Belleisle" on the map, which was the old residence of the Marquis de Belleisle and had been strongly fortified.

[1] This number of 31 officers (taken from the Diary) would seem to show that some officers may have joined after the peace. I can only account for 28.

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WEAPONS.

The Interdependence of Policy, Strategy and Tactics, with their Design, Finance and Provision.

By Major C. T. Beckett, m.c., R.A.

(Continued.)

PART II.

THE objectives of design and the relevant factors which have so far been dealt with have been mainly military in type though some have displayed the intimacy with which military considerations are linked with considerations of a productive, financial or economic nature. The objective of simplicity remains.

There is possibly no objective the true implication of which is so easily misunderstood or with regard to which there is so much confusion. The simplicity which is sought can be of three types. There can be simplicity of manipulation, simplicity of maintenance and simplicity of manufacture. The advantage which is most often claimed for mechanical power is the elimination of human labour proportionate, in some degree, to the power mechanically developed. It is not inevitable but it is a fair generalisation that the simplicity of the machine varies inversely as the labour eliminated by its substitution. Since the subject under discussion is admittedly the least productive form of all labour—the equipment of an army—it is unnecessary to follow back to its ultimate vanishing point the manner in which labour replaced by the machine is absorbed in the manufacture of the machine itself or in kindred ways.

It is sufficient to state that with the mechanisation of traction and fire power in the army, now taking place, a proportion of the personnel displaced from the actual handling of weapons is absorbed by the increased maintenance personnel required in war and the remainder will certainly be required to assist in the increased scale of production which will be demanded of the factories. The principal economy will be in lives and not in money. It may be taken then that simplicity of user and of

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manipulation is inversely proportionate to simplicity of maintenance, and since the elimination of labour leads to increased complication of the power machine which takes the place of the simple tool or weapon the elimination of labour leads to increased complication of manufacture as well.

It is useless, therefore, to demand on the one hand a simplification of user and manipulation, and a reduction of personnel for any given task unless the consequential of increase maintenance liabilities, of a more intricate machine, of greater manufacturing intricacy and finesse, is accepted. Moreover, when the objective is to simplify a number of acts, performed by several pairs of hands, by concentrating them conveniently for the operation of fewer pairs of hands, a greater demand on the brain is involved, a better educated individual must be attracted, and either the time factor must be relaxed to enable the fewer pairs of hands to carry out the same number of operations or, in the extreme case, the only multiplicatory alternative of man's hands must be employed, the separate use of his fingers, his feet or his elbows. The delicacy of touch which any of these alternatives require, necessitates increased delicacy and intricacy of the machine controls and the inevitability of simplicity in one direction having its repercussion elsewhere, is further illustrated. Such, for example, must be the trend of design of tank armament where space prohibits the multiplicity of personnel which time and experience have found most economical to serve a gun. The replacement of a gang of navvies with pick and shovel by a steam trench digger is an apposite example in civil life of a reduction in personnel demanding a vast increase in the complexity of the tool.

So much for simplicity. It is clear that a perfect conception of the exact sphere in which simplicity is to be most patently operative is essential when this objective is under consideration, if maintenance of the objectives desired is to be achieved. It will be well now to turn to the organisation which deals with this subject once more. There are two principles of war organisation which are peculiarly important in the sphere of production. The third principle as laid down in Field Service Regulations is as follows: "The number of subordinates with which each authority is required to deal personally and directly must be limited." That the number of subordinates which can be effectively controlled is

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somewhere round about the figure four requires no further argument. The fourth principle of war organisation is the Magna Carta of the subordinate and is as follows: "Central control must be combined with subdivision of labour and decentralisation of responsibility, the duties and responsibilities of each individual being clearly defined and limited to those which he can adequately undertake."

The Master-General is assisted by four Directors. The Director of Artillery, the Director of Mechanisation, the Director of Ordnance Services and the Director of Ordnance Factories. These directors are themselves served by an equally limited number of assistant directors, who in their turn subdivide their responsibilities amongst more junior staff officers. The whole are served by a body of financial advisers, and by a civilian contracts branch, who in conjunction with the financial branch and subject to any express wish of the M.G.O's staff, apportion the actual work of production between the trade and the ordnance factories. They are also served by chief inspectorates of armaments and of general stores, by various experimental establishments, and by various committees whose collective opinions have the dual purpose of supplying a steadying influence to the more vaulting imagination of the individual and who, when called upon, are able to supply the best available expert advice based upon a close and intimate study of past experience. Upon at least one of these committees representatives of the Navy and of the Royal Air Force sit to ensure co-ordination. Finally, for design, there is the Superintendent of Design who translates specifications into working drawings and criticises external work (the chief inspectors dealing with design from the aspects of technical modifications), and the trade, to whose designers often trained in the services and attracted to the big armament firms for reasons not dissimilar with those which drive cabinet ministers to seek employment in the city, a lion's share of major design work, ammunition and gun design excepted, falls.

There is, then, a general body of consultants assisted by subordinate bodies of expert technical advisers and designers with every facility for trial and experiment at the disposal of the Master-General. There is also the refreshing presence of the friendly rivalry of the great armament firms. As regards the duties of the staff of the Master-General in the field, the functions

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of supply, maintenance and inspection, will hardly be affected by the reallocation of responsibility of 1928. The necessity for the creation in the higher formations of a small staff of "resident consultants" was clearly shown in the Great War. The telegram "Send no more shrapnel send only H.E." as if the recipient were a baker required to deliver the following day brown loaves instead of white, is a famous though possibly apochryphal example of the lack of, and the need for, some representation of the producer at the seat of war, however imperative the necessity for acquiescence in the right of the user to insistence upon his point of view, with consequent dislocation of the organisation of production.

The question of change of pattern of ammunition leads naturally to an examination of the processes of factory production and to a discussion of the limitations which factory conditions, bulk production, standardisation and fine limits of tolerance produce. A factory can be created to produce one single component, a multiple of components, or each and every component of a completed article, or it can be created for the assembly of a part or of the whole article. Where articles are required on a small scale the self-contained factory for the complete article is the usual agent of production, but where articles, such as ammunition, are required on a large scale the system of detail production is the system often found most convenient accompanied by factories of the fourth type which cater for the assembly in part or in whole of the completed article.

While it is apparent that manufacture in detail will be facilitated if one factory can be created to deal with each component, the risk of air attack, to say nothing of risks of sabotage, the work of hostile agents, or industrial troubles make it advisable to distribute the work of manufacture of every component however limited the requirements. The principle of manufacture in detail and of assembly in gross is, in war, capable only of limited application to groups of factories. The national filling factories organised by the Ministry of Munitions are examples of such organisations. There are in every factory at least four elements of organisation which affect design or amendment of design. These are: legal restriction under various factory acts which prohibit certain processes or impose certain conditions of safety for the workers; simplicity

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of machinery to permit of the same machine by simple adjustment carrying out similar jobs to a different scale; this factor has, for example, caused a departure from the ideal contour of shell cavities; and the supply of jigs and gauges. The jig, it may be explained, is the master component of the lathe, while the gauge is the ultimate standard through which the work of the machinist must or must not pass. These are master tools. There are often other special tools required for special tasks but it is on the rapidity with which the supply of jigs and gauges is arranged, and on their accuracy, that the speed of production in the main depends.

Previous reference has been made to the factor of safety and it is ordinarily at this point that its operation commences. There is, however, one other type of factory to which reference must be made and where the factor of safety is first introduced. Steel is rarely made on the same premises or contiguous to the completed product. In pre-war days its manufacture was rarely controlled by the producer of the finished article though to-day mergers between armament firms and steel producers are taking place.

In the production of steel of varying qualities upon which the calculation of the ultimate factor of safety will depend, the utmost precision attainable by scientific methods of mensuration, though still often provided by experience akin to instinct or genius, is required. These factors if dispassionately considered all unite to show that design once set to production cannot be radically amended without much disorganisation, considerable delay whilst jigs, gauges and tools are manufactured, steel possibly of a new tensile strength produced, factory premises built, operatives engaged, schooled and accommodated and, if necessary, factory legislation enacted or repealed. The clerical work entailed by even so small a change as a change in nomenclature is heavy and may of itself absorb the valuable time of a large staff of draughtsmen and clerks. An alteration such as the change in description of the old Mark II Vickers Tank from light to medium was no mere routine matter. The introduction of a fresh nomenclature made the immediate alteration of all drawings, specifications, identification lists, handbooks and other technical literature a matter of urgent necessity if misunderstandings in the placing of demands in the trade or on ordnance were not to ensue.

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This very brief discussion of the share of the factory in design necessitates an examination of the question of industrial mobilisation in Great Britain. A feature of post-war industrial reorganisation has been the tendency of Big Business towards the policy of merger. It is of interest to note how just that number of groups have formed within certain industries as would conveniently be dealt with by one controller in time of war. Four great banking groups, four great railway organisations, two great armament groups—which, with the Imperial Chemical Industries, incorporating the greater part of the explosive trade outside government control, and the Sheffield steel industry, form a convenient munitions group—four great oil groups. All such rationalisation of industry in peace for purposes of industrial and commmercial benefit will be of incalculable assistance in time of war. Of the more detailed requirements of industrial mobilisation little can be said.

The problem may briefly be summarised as the solution of the equation resources = war requirements.

To solve this equation it is necessary first to resolve war requirements into its two components of raw materials and manufacturing capacity, and then to prepare plans for the purchase of the first and for the organisation of the second. There are innumerable cognate problems; man power, profiteering, war legislation, shipping facilities, commerce protection, neutral sources of supply, offensive and preventive action in enemy markets of supply and other kindred questions.

The immobilisation of capital, the rapid depreciation of condition and the difficulties of storage and maintenance, make the maintenance in peace of large stocks of raw materials impossible.

The key items of factory organisation—the maintenance of a sufficiency of jigs and gauges and tools—cannot be considered in view of the high cost of production of these articles and the stagnation of research and design which would be the inevitable result of their creation. The solution which lies along the lines of the upkeep of process specifications, a technical term for mobilisation orders for the formation of a factory, is made difficult by the expense of maintenance of a staff for the preparation and continual amendment of the drawings, descriptions, regulations and other data.

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Such personnel as exist under the factories directorate are of course a cadre for war expansion by dilution into other businesses, but may be insufficient for additional duties of any kind. Even the allocation of definite duties to certain firms is out of the question as firms go out of business, change their location and often their occupation into the bargain. Production plans must in actual fact be confined in principles.

The American Journal, *Army Ordnance*, for September—October 1928, under the title "The Decisive Decade, 1918—1928," an evaluation of America's first ten years of industrial preparedness, is a refreshing confirmation of this belief. A well-informed critic has remarked "Industrial Preparedness in Peace is like musical chairs. No one knows when the band will stop." Industrial preparation in time of war is a very different matter. One knows when the music will stop. The history of the Ministry of Munitions, therefore, excellent guide though it may be as to the ultimate result which is required, is of little use for the preliminaries of peace organisation. These must be discussed with the representatives of industry, and principles and quantitative requirements fortified by the most flexible of organisations laid down. A committee of the principle officers of supply is engaged on this work. A general description of their terms of reference has been announced to the House of Commons by the Prime Minister himself and there the matter must rest until their deliberations are concluded. The keynote of this enquiry is the supply of raw materials, which in time of war must be the governing factor of all production.

There is little historical precedent to serve as a guide to the cognate problems which arise, but in the case of one raw material—timber—there has been published comparatively recently a most valuable historical study.[1] The growth of the need for imported timber, in relation to warship construction, the special purposes of various natures of supply, the development and the neglect of alternative sources of supply, the economic, social, technical and political repercussions of particular circumstances which arose in its connection all are set out in the most attractive form in its pages. In Admiral Consett's "Triumph of Unarmed Forces" a contribution is made to the problem, with a study of the blockade of the German

[1] *Forests and Sea Power*. Albion. Harvard University Press.

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Empire and thereby to some understanding of the problem *per contra* of our own requirements. These are not, however, the only issues which affect the supply question. The peculiar sanctity of a temple in Lake Tsana in Abyssinia may deny to millions of acres of the Soudan water to grow cotton, and the meaning attached to the word "coasts" in long-forgotten charters and treaties may, as in the recent Labrador judgment, throw open to a market fast growing apprehensive at the prodigal destruction of pulp wood forests within haulage distance of waterborne transport, an untouched and limitless supply of raw material, a possible substitute for cotton in the manufacture of propellants, and offer Labrador a source of power of great magnitude.

The development of power in the Highlands of Scotland has made possible the establishment of aluminium factories to exploit Northern Irish bauxite, a matter of some importance in relation to the development of and distribution of aluminium alloys used with such frequency to-day in all branches of design. Calcium carbide—a factor in the production of certain types of propellant—is at present imported from Sweden and the Adriatic. The development of electric power schemes, more particularly in the North, should enable this material to be manufactured at home. The possible use of magnesium alloys in substitution for aluminium might well prove a partial solution of the problem of employing the out-of-work mining population, for the necessary ore exists in this country, while even the question of the importation of meat "live on the hoof" has had its bearing on the supply of leather, the animals bringing their hides with them. The traditional friendship of this country for Chili has not been without its effect on the supply of nitrates for high explosives, though the recent discoveries at Marienthal in South-West Africa will considerably mitigate our dependence on South America as the sole source of natural supply. The fortunate situation of this country as regards rubber supply needs no comment.

With the importation of raw material and the carriage of the finished article, is bound up the efficiency and well-being of the Merchant Service, upon whom the existence of the country must depend. The inevitable consequence is that every article we design will be dock-handled and sea-borne bringing with it sub-

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mission to the fiat of the Board of Trade and Port of London and other dock authorities and involving innumerable restrictions all tending to raise our already high factor of safety.

A discussion of production cannot be left without reference to research, and if it has been left until last it is because the whole trend of argument which this article has attempted to elaborate has been to illustrate the extreme complexity and far-reaching implications which are involved in the control of design and production. The direction of research is vested in the departments of government as users or representing users and is carried out in the appropriate research institutions. Examples which show the varied nature of research are the construction of a new propellant, the means of defence against toxic gas, internal ballistics, the oxidisation of metals in sea water, the behaviour of various types of stone and their protection in a London atmosphere, and other strange questions of every conceivable type. Yet progress must be slow. From research to design may be many years; a gun may well take six years from its inception to its first appearance in the drawing office. The shape of its shell, the position of its driving band, all the varied ballistical characteristics, require long consideration and trial before the requirements of the general staff can be translated into an actual concrete proposition. Breech loading was actually in the service in the reign of King Henry VIII. It can hardly be said to have arrived until our generation. Fixed ammunition was known in a rudimentary form before the Crimea and the Q.F. cartridge had a forerunner in the Peterara breech loader of the earliest times of gun construction. Multiple barrelled weapons with revolving chargers were known in the Crimea and the multiple pompoms which have been developed from them are even now not absolutely perfect.

From design to issue is a long road. Departmental trials, rough usage trials of a most rigorous nature, modifications, general staff trials, further modifications, financial sanction, approval for manufacture after the exhaustion of existing stocks, all follow in slow and paralysing succession the peace time initiation of an attempt to satisfy a need, possibly dead and gone when introduction finally becomes possible. Even the manufacturing and inspection precautions, all very necessary for a service store, will delay the

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issue of an apparently simple article. And so the problem of production as applied to weapons unfolds itself.

There are three essentials for the future. In the interests of the versatility of the staff officer the time will come when there may be urged reasons for the employment of the Staff College graduate in increasing numbers on the staff of the Master-General. If the arguments of this paper are correct, user knowledge with technical comprehension, to put it no higher, should be the qualifications for that staff, coupled with some measure of originality. From the average class which any college may turn out few will emerge with their originality much further developed and in some the strain of the training will have destroyed what little previously existed. In a shortage of trained staff officers the general staff will get the pick. Intimate user knowledge the staff college graduate will seldom, from the pressure of other demands on his time, be able to supply. The door to the staff of the Master-General, even if thereby the open door to staff employment in other branches follows, must remain open to representative technical and user knowledge, and interchange with other branches of the staff should be mutual.

The second essential is an intelligent public opinion. The hearty character seated on the Mess fender, a glass of cordial in one hand and a row of empty glasses on the mantelpiece behind him, enquiring of the world at large, to the admiration of the last-joined subaltern, "Why the ——" somebody doesn't do something or other which he knows for a fact they have got in America, Czecho-Slovakia or Roumania, or somewhere equally irrelevant, is a public danger. Every officer, between the third and twelfth years of his service, should seek the widest opportunities for experience, as far away from Salisbury Plain or Aldershot as possible, so that he may with advantage return to give the service the fruits of his observation. Tropical, colonial, Indian and territorial training experience are all invaluable. It is all "user" experience.

The third essential is that the closest touch should be maintained with civil practice. This should primarily be the duty of the technical advisers and staff. Their low establishment and the weight of routine both conspire to chain them to their desks and to

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a somewhat limited service outlook. Just as Naval and Royal Engineer officers are seconded to certain universities it would be excellent if selected technical officers could be seconded to civilian firms, not necessarily munition firms, or sent to study at the industrial universities of the north and of the midlands. Such opportunities would supplement the courses of the Military College of Science and other establishments. The dearth of officers offering themselves for technical specialist duties, however, is a great handicap to any proposal thus to broaden the basis of their experience. To sum up, it is only by the maintenance of originality and user experience on the staff, by the closest touch with civilian practice, and above all by the cultivation of an intelligent and articulate user public opinion that progress in the production of weapons will be maintained.

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THE MECHANISED BATTERY STAFF.

By Major G. A. Cammell, D.S.O., R.A.

ARTILLERY mechanisation, so far as the traction of guns is concerned, has no doubt made considerable strides. Whether the same can be said in regard to the battery staff is more doubtful. This may be partly due to more attention having been devoted up to date to the former than to the latter side of the problem, but there has been a feeling, it is thought, amongst those closely concerned, that with a mechanised staff there is a loss of speed in reconnaissance, a loss of flexibility and control, and more vulnerability, as compared with a horsed staff, and that these are inherent difficulties which are unlikely to be overcome. Whether this is justified or not remains to be seen, but it must be accepted that the problem is a difficult one, and it seems to depend for its solution upon a successful co-operation between the designer of vehicles on the one hand and the user, or regimental officer, on the other. It is with the object of making some sort of contribution from the working end, therefore, that this article has been written.

The chief difficulty which arises with a mechanised staff is the question of flexibility, or power of sub-division into small detachments, which a staff must possess; such parties as an F.O.O. and his signallers, an officer's patrol, the brigade survey party, and the staff for a detached section. Where each man is mounted on a horse these things are not difficult to arrange, and there is a minimum of disorganisation when casualties occur. With M.T., however, circumstances favour the adoption of a large vehicle. A satisfactory cross-country performance demands a vehicle of a certain size, also from the standpoint of general economy a few large vehicles are better than many small ones. The question therefore arises—What is the least number of vehicles with which a battery staff can work efficiently? and further—what should be their size, or seating capacity? In pursuing this line of investigation it is proposed to make up an experimental staff, with due regard to essentials from the working point of view on the one hand and to economy on the other, to put it through the test of a few practical situations and then to see what lessons can be extracted.

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The principles of Artillery Training, Vol. I, Chap. 6, will be followed as closely as possible. Let us first take the B.C's reconnaissance party, viz. :—

B.C.	A group signallers.
B.C.A.	G.P.O.
Range taker.	G.P.O.A.
N.C.O. i/c signallers.	B.S.M.

An obvious point to begin with is that the B.S.M. must be individually mounted. Next it is very desirable that the B.C. should have independent mobility in a small (but not solo) machine in order to facilitate reconnaissance. While it is often less distracting for the B.C. to drive himself on these occasions, rather than be driven, he should have a driver in order to be free, when necessary, to read the map.

For the remainder to travel in a single vehicle would not make for speed and efficiency, for several obvious reasons :—

1. Simultaneous reconnaissance by B.C. and G.P.O.
2. The B.C. wants a vehicle near his O.P.; he may want to move it, or he may have to retire quickly.
3. The G.P.O. wants a vehicle near his command post; he may want to go to a bearing picket, and in case of an advance he wants to be able to join the B.C. without delay.
4. There is more scope for speed and flexibility in laying down and picking up telephone wire between O.P. and command post, or vice versa, if two vehicles are available.

It is further desirable for the N.C.O. i/c signallers to have independent mobility. The nature of his work gives him a roving commission. He may be required to join at a moment's notice a retirement party or a detached section, and he is not much good if he is tied, say, to the O.P. car a mile or more in front of the battery. The needs of this party might be met, then, by three small vehicles to carry the B.C., B.S.M. and N.C.O. i/c signallers, and two cars to carry the remainder, the remainder being divided according to their positions in action, i.e. the O.P. party in one car and the command post party in the other. This simplifies procedure and the collection of the party for a move. The question of drivers for this party may now be considered. It is generally rumoured that the place of

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the motor cycle, or at any rate the M.C. combination, for cross-country work is to be taken, more or less experimentally no doubt, by a light two-seater car. Supposing this to be the case we require three of these. The B.C. must have a driver to himself, but there is no reason why the second seat in the other two cars should be occupied by a whole-time driver. It could be filled by a spare specialist likely to be wanted quickly, such as a signaller or surveyor. In practice no doubt he would be able to drive if required. A driver is required for the O.P. car, in order to take it away and hide it, or drive it while a cable is being laid. A driver is not so essential for the G.P.O's car, he himself, or one of the signallers, can drive, but it is certainly advantageous to have one, for cable laying or taking the car to the wagon line. We will give him a driver, and the distribution then becomes as follows:—

2-seater cars.	*O.P. car.*	*G.P.O's car.*
B.C., driver.	B.C.A.	G.P.O.
B.S.M., spare specialist.	Range-taker.	G.P.O.A.
N.C.O. i/c sigs., spare specialist.	2 signallers.	2 signallers.
	Driver.	Driver.

We will now list the remaining personnel who either constitute the staff or may have to travel with it, and deal with them.

Captain.	B group signallers.
B.Q.M.S.	Mounted orderlies.
Battery leader.	Lewis gunners.
	R.A.F. W/T operator.

The captain must have independent mobility and he should have a two-seater car. The duties of the B.Q.M.S. in Chap. 6 demand that he should be individually mounted. They may have been affected to some extent by the fact that he always was so, but we have not included a farrier, someone must look after the first line transport, and he should not be tied to it. As, however, it may be just possible to carry on without him, and as economy is to be a feature of this staff, we will not give him a special car. Mounted orderlies are essential. The B.C. wants one when he goes forward to meet the brigade commander, brigade H.Q. want one from each battery for inter-communication. They have many uses, administrative as well as tactical, and it is thought that

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the solo motor-cycle, nine times out of ten, is adequate for the work. As an experimental minimum three motor cycles will be allowed. Whether a Lewis gun and crew should travel with the staff or on the gun tractors is a question. There is not much in it either way as regards the gun's utility. If they travel on a staff vehicle they are liable to cause complications when special distributions have to be made, so we will leave them for the present with the guns. An R.A.F. wireless operator must be allowed for. The most suitable place for him and his set is in the G.P.O's car, so we will put him there, which brings the number travelling on this vehicle up to six. There remains the battery leader and B group. Let them have a third car, and a driver. The biggest load so far is six, so let us assume for the purpose of argument that the large cars are 6-seaters. We now have a staff which is, on paper, completely mobilised, in three 6-seaters, four 2-seaters and three motor cycles. Let us now put it through the test of a few practical situations and see how it works. First let it be stated that where a particular method of procedure is adopted, often without agreement, from a choice of alternatives, it is with no desire to be dogmatic, but merely brief.

Case I. An advanced guard (6-gun 18 pr.) battery.

The B.C. and an orderly are with the advanced guard commander, and the battery is in the line of march of the main guard, no guns being with the vanguard, but a reconnaissance patrol is required with the vanguard. The first question is—what shall the patrol consist of? The B.C. might send one of his 6-seaters, or he might send an officer in a 2-seater. As it is really a one-man job he chooses the latter alternative, and as he likes to preserve his normal distribution as long as possible he sends his captain. In due course the advanced guard commander goes forward to meet the vanguard commander, taking the B.C. with him, to deal with a situation. Here (it is to be hoped) the B.C. connects with his captain. It transpires that the battery will be wanted, so the B.C. sends off his orderly to appoint a rendezvous for his reconnaissance party and another for the battery, and accompanies the advanced guard commander on a reconnaissance, taking the captain with him. A plan is made for observed covering fire, but the O.P.

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will be some way from advanced guard H.Q. The advanced guard commander says—"I don't want to lose touch with you during this fight." How does the B.C. compete with that? He arranges to send his captain to H.Q. as soon as the battery is in action and the wagon line established. The B.C. then picks up his staff and makes his own reconnaissance, finds his O.P., assembles his staff near by under cover, points out to the G.P.O. where to look for a position and gives his instructions. The G.P.O's car goes off, laying a wire as it goes. If the G.P.O. is in doubt as to where the actual position will be, he can drop the drum and a signaller overboard at a certain stage, complete his reconnaissance and then send the car to pick them up and complete the line. The O.P. staff dismount and proceed to the O.P., laying a wire by hand. The captain picks up an orderly, or the B.S.M. if he has finished his job, finds his wagon line, sends an orderly to the position to fetch the gun tractors and decides how to dispose of them when they arrive. He leaves the B.S.M. in charge and goes off to advanced guard H.Q. The action passes off successfully and in due course the march is resumed, but the advanced guard commander now asks for a section of guns to accompany the vanguard.

Case II. Action of a detached section with a company of infantry forming a vanguard.

The staff to accompany the section is found as follows:—the third, or battery leader's, car containing the section commander, his senior No. 1 as G.P.O., 3 signallers of B group and the driver.[1] The fourth signaller travels on the gun tractor. This leaves the B.L. without independent transport, so that he has to ride on a gun tractor, which is a handicap, and makes the method of advance by keeping touch almost out of the question. It would be possible to substitute a motor cycle orderly for the B.S.M. and put the battery leader in the B.S.M's car, but this is not very desirable.

We will now follow the fortunes of the detached section. The section commander and his staff move with company H.Q., the guns further back under the junior No. 1. The country is fairly flat and enclosed. An action develops in front and in due course

[1] It also would carry as part of its normal equipment telephones, cable and the third director.

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reports are received from each forward platoon that they can make no further progress owing to fire from two machine-gun positions. The company commander goes forward with the section commander and makes a plan. He intends attacking with his two remaining platoons to make good an objective which is beyond the zone of immediate observation, and wants artillery support throughout as far as possible, but especially for the first stage which involves the overcoming of the machine gun resistance. The section commander says he will give observed support for the first stage, and will then move his O.P. forward for the second stage, and asks if anyone knows exactly where the machine guns are. A platoon commander says he can definitely show him one of the positions, from a certain point which he indicates to him on the map, and the section commander says he will meet him there later. He asks for 45 minutes up to zero hour, which slightly staggers the company commander, and then goes and reconnoitres for, and finds, his O.P. What he would like to do now would be to send his G.P.O. off to get the guns into action and on the line, go himself to the platoon commander and return to find communications established. But this cannot be done as they have only got one car, and furthermore he has not quite enough confidence in his No. 1's map reading and director work to let him carry on unaided.[1] So he goes off and finds the gun position (in this sort of country it might be half a mile away) and sends his orderly to fetch the guns. He then works out a bearing for his G.P.O., drops him and the director and the one command post signaller, tells the O.P. signallers to lay a wire on foot to the O.P. and goes off to meet the platoon commander. Rounding a bend in a lane he gets what he did not expect so soon, a burst from a machine gun. He then takes to his feet, finds out the target, and on his return his driver tells him that a bullet has been through the radiator. He drives the car as far as he dares, takes to his feet again and is just in time for his programme. Over his subsequent experiences, however, we will draw a veil, they are two poignant.

The lessons which, it is hoped, emerge from this are as follows:—Firstly that here we have been relying on one engine, as

[1] This may be pessimistic, but nevertheless it is thought that in war it will not be uncommon.

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compared with about nine in the case of horses, and that one bullet can therefore practically obliterate the value of a section of guns. Secondly that with only one car for his staff a section commander may be too much up against the time factor, there is very little chance of simultaneous work. Thirdly that where it is not possible to send a second officer with a detached section, it may be advisable to include the G.P.O.A. in the staff, or someone specially trained in director and map work. An appropriate staff for a detached section might therefore be:—Two 6-seater cars, one to carry the section commander, two signallers and a driver; the other to carry a No. 1, the G.P.O.A. and two signallers, or alternatively an officer and two signallers, in which case the G.P.O.A. might go with the section commander as his B.C.A. A cyclist orderly. The empty seats may appear to be wasteful, but this is not so, the point being that if one car goes out of action it is still possible to carry on by filling up the other.

Case III. The action of a field brigade forming part of a field and light artillery group in a divisional attack.

This is taken from a recent tactical exercise. The idea was that the group should afford its infantry continuous artillery support throughout a long advance in rather close country. The attack started at dawn with predicted covering fire. It was considered that the execution of this task would involve the simultaneous employment in the brigade of:—

An F.O.O. per battery in addition to the main O.P.
The brigade survey party.
One, or more, officers' patrols.

In addition it was thought that the C.R.A. and the group commander might each want an officer's patrol for keeping in touch with flank formations, etc. The batteries were not required to detach sections, or move by sections. Now how does the proposed staff organisation lend itself to such an effort?

First the F.O.Os. In the writer's opinion it is of little use sending less than four signallers with an F.O.O. (we are not here considering R/T). In the great majority of cases it is not possible to observe forward and signal back from the same place, so that two stations are necessary, with a telephone line between. In flat or

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enclosed country it is probably impossible to use visual, in which case a long telephone line has to be laid and maintained, which means constant patrolling. Then casualties are most likely to occur. We will suppose, therefore, that each F.O.O. party consists of an officer and a group of signallers, and they are given the third, or battery leader's 6-seater car to travel in.

The brigade survey party is organised in pairs of observers who may be required to work simultaneously at considerable distances apart. Transported in one, or even two, large vehicles, they would be handicapped. They really require five 2-seaters, one for the survey officer and one for each pair of observers. In order to find these it might be assumed that brigade H.Q. could produce one, and for the others it would be necessary for each battery to dismount someone, probably the B.S.M., and substitute a cyclist in his place.

The chief problem confronting an officer on patrol is to get his information back in time to be of use, and he should obviously not be put to the necessity of bringing it back himself if it can be avoided. With motor cyclist orderlies as his means of communication it is thought that he would require two. The transport for an officers' patrol might therefore be assessed at one 2-seater car and two motor cycles. Now this brigade might have to find two patrols, in which case, still assuming the original establishment, each battery would be reduced to one cyclist acting as B.S.M. (the other being at brigade H.Q.), and two batteries would have to dispense either with their N.C.O. i/c signallers, or their captain. It can hardly be denied that in meeting all these calls the resources of this brigade would be unduly strained, and there is still one more consideration to come. A certain incidence of mechanical trouble is a normal expectation, there will always be a proportion of vehicles undergoing repairs or overhaul. Suppose we put it at 10%, which may well be a conservative estimate for war, this means that each battery would have started the day with one of its staff vehicles out of action.

It appears therefore that we must think again, in a rather more liberal spirit, and set out to cover the deficiencies which have been exposed. In regard to Case I, which represents the tactical employment of a complete battery in its simplest form, it may be said that

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the original scale is sufficient, apart from the question of spares. Case II shows the need of a fourth car. Case III shows that a battery may have to detach two 2-seater cars and two motor cycles (one for brigade H.Q. and one for patrol) for brigade, as distinct from its own, requirements. Under such reduced conditions the minimum number of small vehicles with which the battery could comfortably carry on might be put at five, viz. :—

B.C.
Captain.
B.S.M.
N.C.O. i/c signallers.
One orderly.

As to how many of these five vehicles should be 2-seaters and how many motor cycles depends upon a factor which is as yet unknown, i.e. the advantages which the 2-seater possesses over the cycle for cross-country work; it might be that the B.S.M. and N.C.O. i/c signallers could do with a cycle at all times, but at a hazard, and having in mind the question of spares, we will say three 2-seaters and two cycles. Given this number of small vehicles, viz. five 2-seaters and four motor cycles, it can be said that when fully extended, as in Case III, a battery could comfortably carry on with all its vehicles running; it would even be possible, with its fourth 6-seater, to detach a section or move by sections. This scale when applied to Cases I and II satisfactorily disposes of the question of giving the B.Q.M.S. and the battery leader independent movement and permits of a Lewis gun and crew travelling with the staff if required.

Nothing has been said about artificers. Most B.Cs of mechanised batteries would probably agree that the only satisfactory way of dealing with broken down vehicles is to have a special car, lorry, or vehicle of some kind, carrying spares, tools, etc., and artificers always ready to go to a breakdown. This is normal practice in a company of tanks, and it is thought we should adopt it too in the battery. In regard to the size and seating capacity of the staff car, the 6-seater seems to be right. It is important that it should be no bigger, and particularly no higher, than necessary, to facilitate concealment and near approach to a crest.

Dec. '28.

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TANNENBERG AND THE MASURIAN LAKES.

I. "An adjustment of focus." By A. Kersnowski. From the *Revue Militaire Française*, Dec. 1928. Translated by Brig.-Genl. W. Evans, C.M.G., D.S.O.[1]

IF an officer wishes to study the very complicated operations on the Eastern front in the Great War, he is almost entirely confined to German accounts because practically no accurate Russian records exist. The Russian official account was not translated into French until 1926; the important book by General Danilov (Quartermaster-General) only in 1927. It is therefore not surprising that Generals Buat and Camon consulted the German writers almost exclusively when they wrote their studies on the operations on the Russian Front in 1914-1915.

Now the German authors generally represent events on the lines of the famous adage: *Jeder Schuss—ein Russ, jeder stoss—ein Franzos!* Whether they are discussing operations in France where the army "remained unbeaten" (unbesiegt) in 1918, or whether it is the Russian front where the enemy in spite of his three to one, nay tenfold superiority, was always crushed by a heroic counter-stroke, the hostile forces are always exaggerated, as well as the amount of booty taken, especially when they are talking about the Russians. As there are practically no records by the Russians, the Germans have made the most of this fact. One instance is Ludendorff's statement that Rennenkampf had twenty-four divisions—whereas he had just half this number. All these mistakes have the regrettable effect of representing the facts in a false light and so misleading those who wish to get a correct idea of the operations on the Eastern Front in 1914-1915. And so an adjustment of focus becomes necessary and this is what the writer proposes doing.

The unfortunate invasion of East Prussia offers a very wide field for the study of strategy. If one reads the accounts of the movements and battles of the VIIIth German Army ("how one should conduct operations") and those of the Ist and IInd Russian Armies

[1] *Une mise au point.*—Lieut. Kersnowski.

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("how one should *not* conduct operations") nothing could be more instructive, provided the actual facts are correctly stated as to the numbers engaged.

(1) *Battle of Gumbinnen* (August 20, 1914).

104 Russian battalions with 348 guns fought 93 German battalions with 540 guns (of which 120 were heavy). Thus the numbers were nearly equal, the Germans having a great superiority in fire power (nearly double if calibres are taken into account). The German Army suffered a severe check, leaving 4000 prisoners and 30 guns in the hands of the Russians. Thanks to want of vigilance by the Russian cavalry, and the terrible mistake of the commander of the 1st Russian Army (scheme for investing Konigsberg, a perfectly useless geographical objective), the German army was able to break off the battle in time, and retire without interference.

This Russian victory of Gumbinnen, incomplete as it was, had however a great effect on the future conduct of the war. German G.H.Q. (von Moltke) ordered the despatch of six army corps from the western to the eastern front. From the right the Guard Reserve Corps and the XIth Corps were detailed; from the centre the Vth and the XVIIIth Reserve; from the left the XXIst and the XIVth Reserve. The two latter corps had however to be left with Prince Rupprecht whose army had just been engaged with the French counter-offensive on the Grand Couronné. Also the XVIIIth Reserve Corps, disorganised by its not too brilliant *début* at Neufchâteau, remained with the Duke of Wurtemburg, but the three other corps started. The Vth Corps move was counter-ordered later, and it returned to the Crown Prince, but missed the battle of the Marne (it was not engaged until it fought below Troyon on September 9th). Regarding the German right, it found itself deprived of two army corps at the most critical period of the war. The troops sent to East Prussia were lacking to fill the fatal gap between von Kluck and von Bülow. *This historic breach, then, was the indirect but the most important effect of the battle of Gumbinnen.* Rennenkampf's soldiers thus had their share in the victory of the Marne, as well as those of Foch and Franchet d'Esperey.

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(2) *Battle of Tannenberg-Grünewald* (called by the Russians battle of Soldau, 25—31 August, 1914).

Such a disaster as this has never been seen. The 2nd Russian Army, strength 160 battalions with 516 guns, was destroyed by the VIIIth German Army of 153 battalions with 780 guns (180 heavy). After a short engagement the 6th Russian Corps broke off the fight so that the battle was actually fought by 128 Russian battalions with 408 guns against 147 German battalions with 770 guns. The fire power of the Russians as compared with the Germans was as 1 to 2·3.

German writers claim to have captured 90,000 unwounded prisoners (some even say 95,000). As for the number of guns, some say 500, others modestly content themselves with 350. Some military critics such as the Swiss Colonel Egli add 70,000 killed and wounded to the huge number of prisoners (90,000). This gives Samsonoff's army a total of 160,000 casualties out of 152,000 men, i.e. 105% . . . . No remarks on this are necessary. What really were the Russian losses at Tannenberg?

The war strength of a Russian army corps of 32 battalions was 28,160 rifles (officers included) and 108 guns: 96 76$^{m/m}$ guns and 12 120$^{m/m}$ howitzers. If one adds personnel, of artillery, engineers and first line transport, a total of 33,000 men is arrived at—(not counting the medical services and second line transport which had not yet crossed the frontier).

Such was the composition of the 6th, 13th and 15th Corps. The 1st Corps was stronger: 44 battalions, 132 guns=46,000. On the other hand the 23rd Corps only had 20 battalions and 60 guns, say something over 22,000 men. The 1st and 6th Corps losses were comparatively small—the count of arms taken after the battle showed a loss of 8000 men and 14 guns in the 1st Corps, 8000 men 16 guns in the 6th. The 13th, 15th and half the 23rd were lost with all their material. There were in these five unfortunate divisions nearly 90,000 men (84 battalions 276 guns—the troops having already suffered from the result of the fighting at Orlau-Frankenau which preceded the battle of Tannenberg). 5000 broke through with the bayonet leaving 85,000 killed, wounded and prisoners. Adding this to the casualties of the 1st and 6th Corps *the total losses of the 2nd Russian Army can be estimated at 101,000 men and 306 guns.* It now remains to determine the number of

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unwounded prisoners. By reference to the archives (or rather what remains of the archives) and by consulting the actors in this tragedy these may be put down as about 56,000.[1] This is very different to the fantastic numbers given by the German writers.

Another question that arises is how far is Ludendorff the hero of this battle? General von Prittwitz is responsible for the idea of the counter-attack to envelop the left wing of the 2nd Army (concentration of the 1st Corps about Soldau on the right of the 20th Corps). General Hoffmann claims to have mounted this "Schlieffen" manœuvre.

By reading carefully the orders of the commander of the VIII Army ("A.O.K.8") during the days of Tannenberg we see that the chief of the German staff had not a correct idea of the general situation.[2] Luckily for the Germans the two wings of the huge pincers were commanded by two very fine leaders: von François with the 1st Corps enveloped the Russian left, Mackensen with his 17th Corps and 1st Reserve Corps overwhelmed the right. Ludendorff ordered the 1st Corps to move on Lahna, von François pleaded ignorance of the order and marched on Neidenbourg and Willenberg (August 28th). The 1st Corps joined hands with the 17th—Samsonoff was surrounded. If the commander of the 1st Corps had obeyed Ludendorff's orders, there is no doubt that, though Tannenberg would still have been a German victory, it would only have been a great *tactical* success.

Nevertheless it is childish to belittle Ludendorff's rôle; whatever one may say, *he directed the battle*. His mistakes were corrected by the interpretation of his orders by his subordinate commanders. General von François adopted the policy of never obeying Ludendorff's orders (which were often impossible) and this invariably led to great success for the German Army. Ludendorff never forgave him, and this is why the 1st Corps commander was never given an important command in spite of his great ability.

As far as the Russians are concerned one must admit the absolute lack of knowledge of the situation by the 2nd Army

[1] The Russian losses in killed and wounded were great. The Rewel regiment (23rd Corps) alone left on the ground 51 officers and 2800 men. Although the losses did not reach the 70,000 killed of Colonel Egli, we may put them down as 45,000. The 1st and 6th Corps got most of their wounded away.

[2] See Hoffmann and von François books and Vol. II of the "German Official History" (The Liberation of East Prussia). The orders are given in full.

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Command. Samsonoff had no control over his army corps; the 1st and 6th gave him no support. The other corps fought on their own initiative with no success.

(3) *Battle of the Masurian Lakes* (7—14 September, 1914).

This battle was between the VIIIth German Army and 1st Russian Army under General Rennenkampf. The VIII Army had received strong reinforcements: the XIth Corps, and the Guard Reserve Corps (i.e. three active divisions and one reserve).[1] Hindenburg could put into the field 190 battalions with 1200 guns (300 heavy)[2] in addition to the *landsturm* troops and the flank guards left opposite the remains of the 2nd Army.

Opposite him Rennenkampf had his 13 divisions in echelon, strongly entrenched on the line of the Deime. This Army having commenced the campaign with a total of six divisions, was first reinforced by two active divisions (2nd Army Corps) then by five reserve divisions.[3] So we are far from reaching the exaggerated number of "24 divisions" given by Ludendorff, and accepted too readily by even the most distinguished of the French writers—a great mistake, and a most underhand manœuvre on the part of the Germans in order to belittle their adversaries. Can anyone seriously think that 24 Russian divisions—i.e. 400 battalions, composed as they were of excellent troops in 1914, would have allowed themselves to have been beaten with such ease by an inferior number of troops? Rennenkampf actually only had 216 battalions (including the 5th Bde. of volunteer rifles) and 720 guns (12 heavy) in his 13 divisions—a force slightly stronger in personnel than the VIIIth Army, but technically much weaker, the proportion of fire-power of the Russians to that of the Germans being as 1 : 2·7.

[1] The Guard Reserve Corps was only a reserve corps in name. It was formed of one active division the 3rd Guard Infantry Division and one so called reserve division which was however, composed for the most part of active troops (e.g. the Potsdam training regiment of N.C.O's). It had 120 guns, whereas a reserve corps only had 72.

[2] Ist and XVII Army Corps each 25 battalions and 160 guns; Guards Reserve Corps 24 battalions, 120 guns; 1st Reserve Corps 25 battalions, 72 guns; 3rd Reserve Infantry Division 13 battalions, 36 guns; 30 battalions of landwehr, 50 guns; and heavy artillery detachments with 250 guns.

[3] The minister Soukhomlinoff having suppressed in 1909 the organisation of the cadres of reserve divisions they had to be reformed in 1914 from whatever material available. They were below strength, the average age of combatants was high and they were very similar to French territorial divisions.

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We will now refer to General Camon's account of the origin and execution of the German plan based on Napoleon's system. The frontal attack by four army corps reinforced by the landwehr failed. The turning movement executed by two corps, the Ist (von François) and the XVIIth (Mackensen), reinforced by von Morgen and von der Goltz's divisions, overwhelmed the left of the 2nd Russian Army Corps and was about to fall on the Russian communications. At this moment the 4th Corps (General Aliev) most opportunely counter-attacked the *XIth Corps* and drove it back. Ludendorff, exaggerating the extent of this check to the *XIth Corps*, ordered von François to support it with his *Ist Corps*. The turning movement lost much of its effect; the IInd Corps rallied and was able to hold its own against Mackensen. Nevertheless the left wing of the Russian Army was seriously threatened and Rennenkampf ordered a retreat. (September 9th.)

The advanced guards of the Xth Russian Army which had just been formed from colonial contingents (troops from the Caucasus, Turkestan, Siberia, Finland), about 44 battalions with 160 guns (the main body had not yet come up) should have protected the left flank of Rennenkampf's army. Unfortunately it was not able to do so. The 22nd Corps was the only complete corps there; but its commander, after only having engaged one brigade out of every four, thought fit to order a retreat after having fired a few rounds from his guns. This inaction on his part greatly helped the German operation.[1]

Rennenkampf's army lost heavily: 70,000 killed and wounded, 30,000 prisoners (according to the Germans) and 150 guns. By September 13th there was not a Russian soldier left on East Prussian soil.

So finished the Russian offensive against Germany. The failure of the Commander of the North Western Group of Armies was complete. The two Russian armies, deprived of all direction from their higher commander, unable to co-ordinate their movements and vilely led, each suffered disasters in which they lost 240,000 men and 480 guns in the three great battles and the remainder of the minor engagements. Nevertheless the sacrifice of so many brave men was not in vain—it bore its fruits at the Marne.

[1] von Morgen's Pomeranian division was responsible for the protection of the German manœuvre group against the 22nd Russian Corps in the Augustovo—Swalki area.

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(4) *Winter battle of the Masurian Lakes.* (Bialystok—Augustovo, 7—21 February, 1915.)

This operation, conceived on quite a Napoleonic scale, aimed at the destruction of the Russian armies of the North-west, by falling on the right of the Russian line held by the 10th Army. To General Otto von Below's *Xth Army* the task was assigned of striking the decisive blow by exploiting the envelopment.

The *Xth Army* consisted of four corps :

XXI (Fritz von Below),
XXXVIII (von Hutier),
XXXIX (von Staabs),
XL (von Eichhorn),

reinforced by three landwehr divisions. The last three corps were new formations of first-class troops; young volunteers stiffened by veterans of Tannenberg and the Yser. About 136 battalions with 600 guns.

General Siever's Xth Russian Army also had four corps; 3rd, 20th, 26th and 3rd Siberian, say eleven divisions (of which five were active). They differed considerably in quality, the 3rd and 26th Siberian being corps d'élite, whereas the 3rd and 26th Corps were composed of reserve divisions of very moderate fighting value. Total strength 168 battalions and 576 guns. At the muster on February 3rd, 130,000 men were present, or 60% of the regulation strength. Thus they were considerably weaker than the Germans whose battalions had been brought up to a strength of 1100 rifles.

In spite of difficulties of every description (forests, snow blizzards, and then a thaw) the German offensive launched on February 7th was carried out with great vigour. The first push fell on the right flank of the Xth Army—the 3rd and 26th Corps who, as we have seen, were not the best of troops; their resistance was very quickly overcome and they were put out of action for a considerable time.

Meanwhile on the left of the Xth Army the 3rd Siberian Corps (14,000 rifles) held Lyck (made an admirable defence, wrote Ludendorff), against three times their own numbers. When their ammunition ran out and they were threatened with envelopment, they had to retreat on February 12th after holding on for four days.

On February 12th all the Corps of the Xth Army except the

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20th in the centre[1] were fighting in retreat. This corps was very strong (four divisions); even after detaching a mixed division of 12 battalions to support the 3rd Siberian Corps, it had 52 battalions and 160 guns—40,000 men including artillery and first-line transport. Now the 20th Corps remained in a salient formed by the retirement of the neighbouring corps and the flanks were quite unsupported. General Boulgakoff, the corps commander, saw his danger in time; the German "pincers" were clearly defined, but it was in vain that he urged on the army commander the necessity for a retreat. General Sievers, maddened by the defeat of his army, was determined to show his teeth, and definitely ordered the XXth Corps to hold the Augustovo region at all costs in view of a counter-offensive. On the afternoon of the 13th, when this immolated corps was completely surrounded, a retreat was ordered. It was too late . . . .

Then commenced the death struggle of the XXth corps. Surrounded, hunted by three enemy corps, it put up a desperate resistance; whole divisions having exhausted their ammunition charged with the bayonet. General Boulgakoff hoped to break through to Grodno, but this was not humanly possible, his army corps, decimated, was reduced to the strength of a brigade; companies, according to General Danilov, only averaged twenty men. On the 20th February, after fighting gallantly for eight days in the great forest of Augustovo, the remains of the 20th Corps laid down their useless arms, their last cartridge expended.

The German offensive came to an end about Bialystok—Grodno, the strength of the Xth German Army being insufficient for the task assigned to it. The tactical success, however, was considerable: the Xth Russian Army had been completely routed and had lost over 80,000 men—i.e. nearly two-thirds of its strength.

The Germans claim to have taken 110,000 prisoners on this occasion. This seems as gross an exaggeration as the statement that Rennenkampf had twenty-four divisions. It is a "bluff." We have seen that there were hardly 130,000 men in the eleven weak divisions of the Xth Army. Of the four corps in this army, one ceased to exist, the three others got away with fairly heavy losses in men and material. The Russian commanders who took part in

[1] During the commencement of the battle the Germans confined themselves to making demonstrations against the 20th Corps.

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the battle estimated the losses at between 80,000 and 90,000 men and 240 guns (of which 160 belonged to the XX Corps). Most of the wounded fell into the enemy's hands making the total number of prisoners over 50,000. Probably they amounted to 55,000, exactly half the number claimed by Ludendorff. Once more it must be stated that the total strength of the whole army was under 130,000.

Such are the facts about the principal events that occurred at the commencement of operations on the Russo-German front. These events have remained too long a puzzle to the foreign reader. It is our own fault, we Russians, for having remained silent so long regarding the statements of our enemies which are often incorrect and always underhand. Let us hope that this little article will help people to "dot the i's" in certain doubtful questions. It is high time to contradict fairy tales, to establish dates and numbers, and give the lie to our calumniators.

The Russian Army had a difficult and thankless task in the Great War. The men were short of everything, and had only rifles with which to reply to the enemy's artillery fire. In spite of this there were brilliant successes that largely made up for our reverses. From 1914 to 1917 the Russian Army took 1,600,000 prisoners and 3600 guns (mostly taken from Turks or Austrians, but quite a good proportion of Germans); naturally these victories cost dear: 90,000 officers and 1,800,000 N.C.O's and men were killed or died of wounds. The last sleep of these gallant men must be an uneasy one, as their sacrifice is neither appreciated at its true value by the Allies, nor, alas, by their fellow-countrymen. Peace be on the memory of the unknown warriors who by the sacrifice of their lives contributed to victory.

II. A review by Captain René Andriot of articles by Commandant Koeltz in the *Revue de Paris* (15th Sept.—1st Oct., 1928). Précis by Brig.-Genl. W. Evans, C.M.G., D.S.O.

IN the *Revue Militaire Française*, November 1928, Captain René Andriot reviews an article by Commandant Koeltz that appeared in the *Revue de Paris* (15th September, 1st October) under the title "La genèse de Tannenberg." The article is mainly

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written with the object of ascertaining "whether the claim Ludendorff put forward to be considered the 'man of Tannenberg' is sustained." Anyone who has read General Ironside's book must have his own ideas on this subject, but as Koeltz's article gives details of what was going on at the German VIII Army Headquarters between August 20th and 23rd it is worth quoting from. Capt. Andriot says:

. . . . Comdt. Koeltz takes us to von Prittwitz' headquarters on August 20th 1914 and shows us the magnitude of his task. With the *VIII German Army* (nine divisions, of which six were active; a few landwehr brigades and a cavalry division) he had to defend East Prussia against two Russian armies: the army of the Niemen to the east, that of the Narew to the south—a total of at least eighteen divisions, all active, and eight cavalry divisions. His front extended over 600 kilometres. To protect East Prussia by remaining strictly on the defensive would have been to court certain defeat; the province (E. Prussia) could only be saved from invasion by assuming the offensive and defeating the two Russian armies in detail.

These indeed were the instructions he had received from von Moltke.

The 20th August was a very critical day. von Prittwitz attacked the army of the Niemen (Rennenkampf). In the morning all went well and the battle was thought to be won, but about 2 p.m. the army of the Narew became dangerous, and the question arose as to whether they could finish with Rennenkampf in time to reinforce the troops holding Samsonoff. This seemed unlikely and at 5 p.m. von Prittwitz was faced with the possibility of having to retreat. General von Grünert, the quartermaster-general of the army, and Lieut.-Colonel von Hoffmann, chief of the operations branch, knew that the whole of the army of the Narew was advancing and that its left wing extended much further to the west than was suspected. "I am afraid," said Hoffmann, "that the nerves of the general and the chief of the staff (General von Waldersee) will never be strong enough to stand a report of this nature; it will be best not to show it to him. We must break off the battle to-morrow and turn against the army of Warsaw." . . . . . but von Prittwitz already knew the situation and ordered the

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army to "break off the fight and retire behind the Vistula." Then commenced an interminable argument between von Prittwitz, Grünert and Hoffmann and eventually this was modified. It now remained to be seen whether the *8th Army* would succeed in disengaging itself. This it was able to do on the night 20—21 August without difficulty.

This news created a great sensation at German G.H.Q. Moltke ordered von Prittwitz to remain east of the Vistula at all costs, but from the *8th Army* reports and from telephone conversations with its staff, Moltke and his entourage concluded that von Prittwitz and his chief of staff were not the men to cope with such a situation. Another army commander, or more important still another chief staff officer, "might be able to ward off the terrible fate which threatened their eastern provinces," and he bethought him of his former assistant on the general staff, Ludendorff, who had just been distinguishing himself at Liege. His next step was to find a successor to Prittwitz . . . . a chief who would get on with Ludendorff and who would accept responsibility and display initiative.

Meanwhile von Prittwitz, influenced by his staff, had become more optimistic and "accepted the proposals of his chief of staff to concentrate the whole of the *8th Army* against the left wing and flank of the army of the Narew." Preparations were made for the resumption of the offensive, and an operation against the right was also contemplated.

On August 22nd at midday Hindenburg was appointed to command the *8th Army* with Ludendorff as chief of staff. Ludendorff went to Coblentz to see Moltke. They agreed that Rennenkampf must be left alone, and the army of the Narew must be attacked at once with the maximum force available.

On August 23rd Hindenburg and Ludendorff arrived at Marienburg. Ludendorff went through the instructions already issued to corps commanders with Colonel Hoffmann. He was surprised to find that all the necessary orders had been given and approved them, altering nothing essential.

On August 24th Hindenburg and Ludendorff made a tour of the line to get more closely in touch with the situation. That evening they decided to attack Samsonoff's left.

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On August 25th the Germans intercepted a Russian wireless message giving the whole of Rennenkampf's orders. Later in the day another wireless message giving Samsonoff's orders was intercepted. From these orders it seemed clear that no danger was to be anticipated from Rennenkampf and so the plan of action of the *8th Army* was confirmed.

The further speculations of Koeltz need not concern us, but one interesting fact he mentions is that at a War-Game in Berlin in 1907 under von Moltke the action of a German army in East Prussia against two Russian armies—one on the Niemen, one on the Narew—was the theme. If Moltke's solution is read it will be seen that the Tannenberg plan was originally due to him. That von Moltke's war-game solution, von Prittwitz's and Ludendorff's plans were essentially the same is due to the *unity of doctrine* that was the chief characteristic of the Great General Staff at Berlin.

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A MAIDEN EFFORT AFTER MARKHOR.

By Brig.-General Cosmo Stewart, C.B., C.M.G., D.S.O.

I ARRIVED at Gilgit in November 1893, and was lucky enough soon to get a chance of trying my fortune after markhor. Very few days spent in the place were sufficient to hear some astonishing tales of endurance and climbing in rock and snow on the part of certain hardy and tireless sportsmen in pursuit of that great animal, half of which I confess I put down to the hunter's traditional exaggeration of his own performances. But the little station mess, improvised in an old sepoys' barrack room, was hung with a number of grand ibex, markhor and urial heads, which would have graced the walls of the Natural History Museum, and I was at once consumed with an ambition to emulate them. I had done a certain amount of big game shooting in the jungles of Central India, but never any hill stalking, and so was totally without experience of this kind of thing.

The British Agent at the time was a fine old fighting soldier of the Frontier Force, always keen on encouraging the sporting instincts of youngsters, and I had no difficulty in securing the promise of ten days' shooting leave at Christmas. This I was told was the very best time of the year for markhor, as the early snow drives the game down to lower altitudes, and it being also the commencement of the rutting season, the old heads are more easily located.

But everything else remained to be arranged, and time was all too short when I started on my preparations. I had come up broke to the world, and without a rifle. Making a flying visit to Gilgit from the camp of the mountain battery, I jumped at the chance of purchasing cheap an old rifle left for sale by an officer who had returned to India in the autumn. No armourer would have passed the barrels and no one else would look at it. But it was a case of Hobson's choice, a double barrelled ·500 Express, and I seldom owned a more prized possession, until I learnt by bitter experience that it made a pattern a foot in diameter at 100 yards.

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Advice was given freely to the tyro. All the best nullahs within reasonable distance had long since been bespoken. But I was put on to one called Duchin, nearly seventy miles from my camp, which ran back into high mountains from close to where the Astor river flows into the Indus at Ramghat. No one had visited it that year, and it could always be counted on to hold two or three really good heads. It had the reputation of being one of the most difficult nullahs in a very difficult part of the world, but that conveyed little to me in my ignorance, and affected my keenness not at all.

My leave was due to begin in about a week, and the greatest difficulty of all was to secure the services of a reliable shikhari, without whom such an expedition would be hopeless. They were very few and far between, and all the good ones seemed to be permanently engaged. At last I was told of a famous man, Abdur Rahman by name. There was no finer or more skilful shikhari in the Agency, and he dwelt in a remote hamlet only ten miles or so from Ramghat. He had been for years with Manners-Smith, a redoubtable hunter, and was now unemployed. During the Hunza-Nagar expedition he had aided Manners-Smith in reconnoitring the cliffs at Nilt at night, up which the latter subsequently led the storming party in the dark to assault at dawn the sangars, which hung on the edge of the crest above, and for which act he deservedly was awarded the Victoria Cross. But Abdur Rahman was reputed to be a somewhat independent character, and it was considered doubtful whether he would "come to call." There was no time to get a reply from him. So two gunners on mules were despatched to his village, bearing an urgent summons to him to meet me without fail at a *rendezvous* in Duchin Nullah on an appointed date, and I had perforce to start off trusting to luck. My trusty servant "Ugly," an old sepoy, was sent on ahead with a tent, rations, and such shooting kit as I possessed. He had been servant to the officer from whom I purchased the rifle, and knew Duchin. He told me I should find my tent three miles up the nullah in the stream bed.

Several days later I rode through from Gilgit, doing the 50 miles to Ramghat in one day to save time, and handed the pony over to a syce. A guide was waiting, and after a very

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welcome cup of exceedingly sweet tea, hospitably prepared for me by the Indian officer in command of the post, we left late in the afternoon to seek the nullah. The entrance to it was some little distance away, and a dark forbidding day was drawing to a close in a dark forbidding place as I toiled wearily up the frozen torrent bed between great boulders shut in by rocky cliffs, hoping at every turn to see my little tent and a fire, and to find that Abdur Rahman had arrived. The clouds lay banked against the mountain sides not far above me, shutting out all view, with the snow line close below them; tired, hungry and cold, I began to think markhor shooting was not going to be just the beer and skittles I had fondly imagined, and indeed might be overrated. An icy wind blowing down the nullah added to my discomfort. After going for what seemed an eternity, and just as darkness was descending, we came on the tent in a gut between two tremendous cliffs, the spot having been selected by "Ugly," as he thought very cunningly, so that light from the fire would be screened from the shooting grounds above. He had arrived only a few hours earlier, the mules having made heavy weather of the nullah bed. The shikhari was conspicuous by his absence. The prospect was not of the brightest, as without my guide and mentor I felt utterly at a loss how to proceed. There was nothing for it but to have a much needed meal and turn in for the night. Rather depressed and still cold I was about to crawl into my blankets, when my little dog began to bark, and I heard voices outside. I poked my head through the flap of the tent, and saw a figure leaning on a *khud* stick in a characteristic attitude talking to my servant. It proved to be Abdur Rahman.

He was a hard, spare little man, rather a dandy, dressed in a puggri of some soft woollen stuff, quite a well made frock coat of puttoo and knickerbockers of the same material, all of a nondescript grey colour. A scraggy, goatee beard adorned his chin, giving him rather the appearance of a markhor himself; he had a large mouth and a pair of extraordinarily observant eyes, which at once attracted attention. He spoke Urdu with a pleasing sibilant lisp like a Pathan, and when he smiled, his otherwise sombre face became lighted up with a singularly engaging expression. Behind him stood a hill man in the voluminous grey home-

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spun *choga* of the country, and girt about the waist by a *kammer-band*. On the ground lay a roll of blankets.

Such was Abdur Rahman, the almost peerless shikhari. He remained in my service for three years, and with his aid I accounted for many fine heads. I paid him royally, and he never failed me. I learnt later that he and his brother, the head man of their village, had been great scoundrels. Before the advent of the Imperial Service Troops with a number of British officers as instructors, the pair had been charged with kidnapping wretched Kashmiri sepoys on the then vile road up to Gilgit, and selling them as slaves to the Pathans living further down the Indus valley. Abdur Rahman had somehow got off with a caution; but his brother was doing a life sentence in the State goal in Srinagar. Abdur Rahman had the reputation among a population of cragsmen of being unmatched, except by one other well-known shikhari, for daring climbing in break-neck ground. He never lost his equanimity, except when in proximity of a bear, when he became an abject coward. He said he had been mauled by a wounded one once, which perhaps accounted for his nervousness. He now came up, salaamed, and said: "Sahib, what made you place your tent here? You are directly under two high cliffs, and rocks are sure to fall during the night. You must shift camp at once." We turned to and moved everything to a spot he selected a hundred yards further on. I saw he realised I was new to the game, and it made me feel rather small. I was soon to be made to feel smaller still! He came to the tent to discuss matters. "Sahib, you sent the sepoys to fetch me in haste, and I was compelled to come with them. But you have given me no opportunity beforehand to spy the nullah, and it is a big one. It is not a good arrangement, and we shall have to take our chance of finding game, it may well be that we shall lose several days."

He then asked me a number of questions, and I could see he forbore with difficulty from smiling, when I told him my only foot gear for climbing consisted of rope-soled boots; that my only tent was the 80lbs. one; that I had no telescope; and not even a *khud* stick. He looked me over and asked my weight; when I said the equivalent of twelve stone, he said I was very heavy for climbing. Indeed the only thing that seemed to please him was

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the rifle; but, as I found later, any double-barrelled rifle of a certain bore was to him the best of all possible weapons, and he never dreamt of looking down the barrels. Corrosion meant nothing to him.

We sallied forth in the coldest of grey dawns next morning. Abdur Rahman had produced some strips of half-tanned ibex skin, called "tauties," doubtless taken off the man he had brought with him, which he wrapped round my feet, leaving the toes and heels protuding in their double socks, and then bound them securely in position with stout square thongs of ibex hide round under the instep. How I hated those tauties! The laces were so tight they bit into the flesh; I kicked my toes against stones innumerable till I could hardly put a foot to the ground; and whenever we sat still for five minutes my feet became like ice. But I got no sympathy; I was assured that *faute de mieux* in the shape of grass shoes, they gave an excellent foothold on rock, and that with my toes free I could not possibly get frost-bitten. There was no such skin as ibex skin, and all the natives used them. Then I had no woollen gloves, and my hands soon ceased to have any sensation save that of pain, as I gripped my way in steep places, often in snow. I had no Balaclava cap to turn down over my ears, and however much I toiled and sweated, the keen wind stung them like a whip lash. Certain—the gilt seemed wearing off the gingerbread!

The weather had improved during the night, and the clouds had receded up the hills, and were breaking in places. As the light got better I saw the nullah stretched for miles ascending into ice-bound mountains. On either side steep rock *khuds* rose for thousands of feet; on the side we ascended, (the southern slope), the snow lay 1500 feet above the nullah bed, but on the opposite side was much lower. Several peaks high above us began to peep out through the clouds, dazzlingly white in the sun. It was all very beautiful and grand, but I had little inclination to admire the scenery. The climbing became increasingly difficult and painful, and Abdur Rahman only hustled us on. "The wind will continue to blow down the hill till about 9 a.m.," he said, "and then blow up till nearly sundown. We must be up on the shooting ground before it turns, or our scent will give us away. From above also we shall be able to spy the ground better."

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The shikhari strolled on without any apparent effort a few paces in front, carrying the rifle, selecting the easiest path for me, and casting keen glances around and above in every direction. I followed with the coolie, who was carrying a wrap for each of us and a little food, and who had been told off to assist my halting steps. I saw them both watching my progress, and before we had gone far, Abdur Rahman gave me his khud stick, paused, and said: "The Sahib is very awkward with his feet, and we shall have to go carefully. Place them where I place mine; use the stick only on the side towards the hill, and do not lean inwards to use the hands to climb, but keep the body upright; if you lean inwards the feet are liable to slip out. By keeping upright you get a better foothold on sloping rock or hard snow."

It was the principle of the inclined plane! I got many other little tips from time to time, the wisdom of which I learnt to appreciate better later on. We ascended slowly, always zigzagging, painfully as far as I was concerned, and with many qualms of spirit, while they sauntered on quite unconcerned. We got up into the snow, and then it became worse; I could not get on without constantly using my hands, despite the exhortations of the shikhari, and they were soon bleeding. From time to time my companions exchanged a few remarks in their incomprehensible dialect, and I could see that they thought very little of my efforts! It was a relief when our leader called a halt, and said we would wait while he scanned the ground. I had on too many clothes, and had sweated through everything, so stripped and hung my shirt out to dry, wrapping myself in a *choga* and getting what shelter I could under the lee of a rock. Then pulling out a pipe I proceeded to fill it, but was at once checked: "The Sahib must not smoke here. The wind is not settled for the day, and we have only come up a short distance. The markhor will scent the smoke from afar, should the wind carry a whiff towards them. Smith Sahib never smoked out shooting until he had had his shot." So my hoped-for consolation went back into my pocket, and again I was made to feel small.

There was nothing to be seen, and we continued upwards. The going got steadily worse, and with a bad head for heights, I did not enjoy myself. In bad places the coolie would climb along

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somehow below me, and support my feet in position with his hands; they seemed to think nothing of it, but to me it was horrid. Once in my clumsiness I displaced a fair-sized stone, which went bounding down the hillside; Abdur Rahman looked round disapprovingly and said: "If the Sahib causes stones to fall, we shall never get near anything; the sound often indicates the presence of man, and attracts the attention of any animal within reach of the sound." So passed the first day. I was made to realise that I was a complete neophite at the game; but by degrees got more confidence, and found a little knowledge was the beginning of wisdom. But I looked across at the opposite side of the nullah, which from where we were appeared perpendicular, and was thankful we were not over there! I found leisure to admire the shikhari; he seldom used the binoculars, yet nothing escaped him. We saw no sign of game, and returned to camp about 5.30 p.m. I thought and felt I had never put in a harder day's work, and was dog tired. It had been rather a nightmare all through and falling asleep after tea, and all through that night, I would wake up with a violent start, dreaming I was still up that *khud* side in the snow, had slipped, and was falling into an abyss. More than ever I felt that markhor shooting was not altogether bliss!

When I had fed, Abdur Rahman came round for a smoke, which he dearly loved, and to discuss plans for the next day. He had been able to spy the nullah effectually from where we had been, and felt sure the markhor were over on the other side of the ridge to the north. We would therefore ascend on the north side, and as it was considerably further, the coolie was to carry up a couple of blankets apiece and some food, and we would sleep out several nights before coming down again. So I must make arrangements overnight; the coolie could not carry a great deal owing to the ground, and we had only the one man. I had Ugly up and told him, and he looked rather blank. He could put something together, but I had no small cooking pots, etc., and who was going to cook for me? He was told to send some meat, tea, sugar, and plenty of *chupattis* (native unleavened bread) which travel and keep well, but are not palatable, and I would chance the rest. I then turned in, done to the world, and what with sore feet, nightmares, and the prospect of a worse climb next day, did not pass a restful night.

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We started again in the dark, just Abdur Rahman and I, the coolie following later with the impedimenta. The going and the feet were bad, and though the climb was not over 3000 feet, the snow soon got deep, in places waist high, and I thought we would never arrive at the top. When we did, the view away up the big valley towards Astor was superb, with the river running in a silver streak far below. Abdur Rahman became more careful. "We are on our ground now, Sahib. The markhor will have come over to this side to get out of the deep snow; be very particular to dislodge no stones, or make any noise."

We proceeded from one point of observation to another, examining a succession of little nullahs a few hundreds of feet deep and a few hundreds of yards across, which ran up to the main ridge. Snow lay everywhere, and the wind was bitter, but I had plenty of time to admire the Shikhari's methods. He would worm his way to a likely point, subside behind a stone, and drawing his grey puggri across his face, remain absolutely motionless for an hour at a time. As he said, the secret of keeping concealed is to remain motionless, as of course all experienced hunters know. I have known a big markhor we were on the look out for to lie hidden for a long time behind a rock, until he turned his head, when the movement of his horns which alone showed, at once gave him away, though he was at a considerable distance. Abdur Rahman knew where to look, and searched all ground within view with his naked eye, seldom using glasses, and nothing seemed to escape him. He would then enumerate all the animals he had seen, and make a fair estimate of the size of any heads. It was an art I never attained; he nearly always had to direct a telescope, before I could spot an animal at a distance.

Once he made a slight motion with his hand, and looking up, I saw a young ibex about 300 yards away on a projecting rock of the main ridge, evidently inspecting us. It is a very rare thing to see ibex in the winter; they seem to remain high up on the mergs underneath the snow. The afternoon drew on, and I began to think markhor must be a myth, when Abdur Rahman slowly withdrew from one of his vantage points, and joined me under cover. He whispered that there was a large herd of markhor down below us in the next nullah. They were out of shot (which meant

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over 200 yards away), and he had observed no good head; but he had not seen anything like the whole herd owing to the ground.

I crept forward and saw my first markhor. They had begun to get on the move down, and as I watched, more and more appeared from under cover of the ground below us, and other places where they had lain up for the day. The herd was a very large one, larger I think than any I ever saw subsequently. Males and females were together, the former warily letting the females go ahead of them, and the latter acting as sentinels on the outskirts of the herd. At first only one or two small heads were visible, but quite sufficient to make me excited. At length Abdur Rahman nudged me gently, and motioned to me to look through the telescope which he had scotched in the snow. A fine old markhor was just appearing from under our side of the nullah, obviously the father of the herd. His horns corkscrewed again and again, and the shikhari whispered they must measure full fifty inches. His venerable beard reached down to his knees, and I forgot all about the snow and the cold as I watched him. He was closely followed by several other shootable heads, all well out of shot. In all there must have been 150 in the herd, and about a dozen heads over 35 inches, and four or five over forty, which at Gilgit we reckoned shootable.

Abdur Rahman said the ground immediately below us was not practicable, and we lay and observed them till dusk began to fall, by which time they had descended hundreds of feet. Every now and again members of the herd would pause and gaze fixedly straight up, scanning the ground above them as well as that below and around. The markhor is the only animal I have ever seen do this consistently. It became plain that we would get no shot that evening. "We must go to where we sleep for the night, Sahib," said Abdur Rahman, "they will not stray far unless disturbed by a snow leopard, and we will come and look for them in the morning." Snow leopards are the bane of the sportsman after markhor or ibex. They are rarely seen, but there is always one slinking about in the ground above a considerable herd. They do their hunting by night, and their pug marks are constantly met with in the snow. Their pelts form a much prized trophy, and to get one, the best way is after shooting an animal, to leave him

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lying without going near him. The snow leopard will nearly always be found on the carcase at dawn the next morning, if approached very warily.

Half an hour took us to the rendez-vous given to the coolie, and we found him waiting for us. A great overhanging rock afforded us a dry floor and good shelter from the wind. The spot was evidently frequented by herdsmen in the summer, and I was thankful I had smothered my blankets with Keating before leaving camp, a very necessary precaution. The hills of India are like the deserts of the Sudan; evil insects seem to appear from nowhere, as soon as anything living deposits itself for rest. That was a bad bivouac! I found my food was limited to chupattis, a raw leg of mutton, with a little tea and sugar. There was nothing to boil water in, and the only firewood was wet assafœtida, which smelt abominably. We dared not light a big fire even if we had had the material, but kindled a small one, and set stones to get hot round it. We then made a pan of clay, filled it with snow, and melted it with the stones, running the dirty water off into a cup, a dollop of whisky rendering it only a little less nauseous. The mutton was cut into slices and toasted; it only got half done, burnt black and tasted of assafœtida. Cold chupattis are not appetising. But hunger made a good sauce and the long-delayed pipe and anticipation of the next day afforded much consolation. We gathered assafœtida to sleep on, and though the cold was intense, managed to sleep fairly well with a couple of blankets apiece.

We were up at the first sign of dawn, and set out in a bitterly cold wind after an unappetising collation, similar to the night before, I personally feeling far from at my best. But we had now a definite quest, and soon spied the large herd well away below us. They were spread out over a good extent of ground, which fell away precipitously, and there was nothing for it but to sit down and wait till they began to come up for the day. The big head was not to be seen, but much of the ground was concealed to us, and they had evidently not been alarmed. Then began a long wait, which is the tedious thing about this kind of shooting. Snow is always treacherous, and most of the ground was impossible for me, while if we moved about incautiously, we were certain to

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be spotted. Abdur Rahman remained in observation, while I retreated at intervals to a sheltered spot and endeavoured to keep a little circulation in my frozen limbs, relieving him at times.

About nine a.m. the herd began to graze up and away from us, eventually disappearing behind a ridge, but it was long before the shikhari would risk a move. We had to make a considerable detour, proceeding very cautiously, Abdur Rahman in bad places testing every foothold before I trusted my weight on it. The nullah in front was safely negotiated, but there was still no sign of the markhor. It was not till well in the afternoon that ascending a sharp ridge overhanging another deep nullah, Abdur Rahman from in front signalled something in view. I crawled up alongside him and warily peered over. There below us, two or three hundred yards away, were a great number of females with a few small males spread over what we could see of the bottom of the nullah, and up the far side, mostly lying down, but every here and there a watchful animal doing sentry, perched on a rock, gazing about in all directions. Still there were no signs of the big heads. "The big ones must be on our side of the nullah, hidden by the ground, Sahib; we will wait till they get on the move again, when perhaps they may come forth." So we waited again, while I occupied the time at intervals pulling the rifle out of its case, and doing aiming drill.

Between three and four o'clock, the first females began to get up and commence to move down, at first very slowly, then with little rushes, reconnoitring as they went. It was beautiful to see them spring from rock to rock, landing with all four feet together, where one would think there was no possible foothold. For a considerable period no big male showed; and then suddenly Abdur Rahman nudged my elbow, and by a glance made an indication towards our left. Almost level with us a fair sized markhor was just emerging at little over a hundred yards. He gazed down for long, and then up and around, looking fixedly in our direction as if he must see us; then he began to move down. As he did so another appeared, and then another. "Wait, Sahib," said Abdur Rahman, as I loaded the rifle and pushed it out carefully in front of me to rest it on a rock, "the big one will be the last to come out." It was a great sight to see those markhor appear, one after

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the other, each seemingly bigger than the last. I had the glasses on them, to make certain of recognising which was the one we wanted, while Abdur Rahman, scarcely less excited, lay close alongside. "Look Sahib, thirty paces to the right down the hill; the big one is coming out!" He had spotted the horns, and I could now see them, moving down the hill, without the body showing. It was tantalising to see him get further and further away, without being able to shoot. At last his head appeared, and then the body, but he was a good 150 yards away. "Shoot when he stops, Sahib, and aim low," whispered Abdur Rahman, and then gave a low whistle. The markhor halted instantly, as wild animals will at the sound, and looked up towards us. I drew a bead and fired.

The smoke of the old black powder hung for a second or two, but Abdur Rahman was watching for the shot with the telescope. The whole herd bolted up and over the next rise in a flash. "You missed, Sahib, I saw the dust kick up from the bullet; you went too high!" Alas! I caught a glimpse of my hoped-for fifty inch head disappearing. I afterwards learnt a rock is a bad rest for a rifle! Later I carried a woollen glove to rest the barrels on to minimise the kick up. I had probably also not allowed enough for firing down hill. The disappointment was great; that markhor had been counted as good as bagged! I had yet to learn how often there is a slip between the cup and the lip at this kind of game.

We wended our way despondently back to our uncomfortable bivouac. Any game near at hand had been effectually scared, so we made a better fire. The coolie had been down to camp, and brought up some cooked meat and a saucepan, so we got some hot tea. After we had fed, the shikhari came along for a smoke, and to discuss plans for the next day. It was useless to think of going after the same lot again, for at least several days; the odds were we would not see them at all. We settled to try in the opposite direction, continuing to bivouac out as long as the weather held up. If it started to snow, which appeared possible, we would have to go down.

We worked hard the next two days, and on the second afternoon I got a good shot, and bagged a head of forty inches. We climbed down to where he lay, and I smoked the sportsman's pipe of bliss, while Abdur Rahman removed the head and skin, hiding

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the carcass under a pile of stones to protect it from the vultures, till the coolie could be sent next day to collect the meat. Markhor shooting now seemed quite good fun, and that hard-won trophy of forty inches was prized as much as my first tiger. It was wonderful to see how the vultures collected, planeing down in great circles from nowhere. I asked Abdur Rahman how he accounted for them. "Sahib, when an animal dies or is about to die, all the ground round about him seems to the vulture to turn the colour of blood. However high up in the air they are, they are at once attracted, and come down to look. They even know beforehand, and will assemble at a spot where there is going to be slaughter. When Chilas Fort was attacked by the Yagistanis (tribesmen in the Indus Valley) in 1892, the inhabitants fifty miles away knew there was going to be a fight, because they saw the vultures flying high up down the valley towards it!"

We spent several more arduous days without result, and then retraced our steps to the first bivouac under the great rock in order to have another look for the big markhor before my leave was up. We found the herd the next afternoon; they had not wandered very far, and snow and hunger had driven them down again to feed. For a long time no big head showed, but just as we were about to come away for the night, the wily old males emerged from some very bad ground high up, and descended in a series of rushes to join the females below to graze during the night. There were still about a dozen males together, the big one as father of the herd letting all the others precede him. It was too late to attempt to get a shot in such ground, and there was nothing for it but to go back and return next day, my last.

We were out early, and took a line higher up in the snow. About nine a.m. we got a view of the herd, well below us, but grazing up hill, and watched them till they were hidden from sight by a precipitous spur. The intervening ground was difficult, the snow making matters worse. But our only chance was to get across in the hope of cutting them off as they came up. It was worse than anything I had tried so far, and proceeding slowly with Abdur Rahman's constant help, it was all I could do to get along, feeling half the time in a horrible funk. But about eleven a.m. we arrived close underneath the top of the ridge. While the shikhari went on

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cautiously to reconnoitre from the top, I tried to restore some circulation in hands and feet. He came back with a smile on his face. "The markhor are on the other side of the hill, Sahib. The females are still lower down, but I saw the tips of the horns of the big one sticking up close over the brow. Get the rifle ready, and follow me very carefully. You will have to take a quick shot for they will be very easily alarmed if they see us, and others are sure to be about."

I made many mental reservations that this time surely I would not miss and wormed my way up after him in the snow. Abdur Rahman made for a projecting stone, and lay down behind it, while I drew up to his side. Very cautiously he took another look. "The markhor is still there, Sahib, very close. Crawl up, and be careful not to shoot at a small one." I elbowed my way forward, and looking round the corner of the rock saw four or five fine heads from 75 to 100 yards away. Something had alarmed them, and they were all looking in our direction. Another moment and they would be off; a hasty glance was, as I thought, sufficient to settle which was the biggest, and taking quick aim, I fired. Out of the corner of my eye I saw him fall, get up and fall again, but at the same instant several others sprang up out of the ground between me and him, which had been concealed to me in my prone position, and clattered away with a rush. One was an enormous fellow, and went away like the wind. I had not thought of getting a second shot, and loosed off the other barrel at him, without apparent effect. Before I could reload he had disappeared over another spur, and I saw him no more. "You missed the big one, Sahib, I saw the strike of the bullet. He was lying within twenty yards of you!" said Abdur Rahman, "it will be useless to look for him any more."

The one I had fired at first lay dead below us, and making our way up the opposite ridge, we just caught a glimpse of the big markhor still ascending six hundred yards or more away, before he finally disappeared. Abdur Rahman was as disconsolate as I was. "I told you the big one was quite close, Sahib," he said, "and you fired at the wrong one. You will go out many times and never get such a chance again. That head was at least fifty-five inches!" However, the one we got proved to be a very nice head of forty-four inches, no mean trophy. I had my pipe while the shikhari per-

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formed the usual offices, and then we wended our way slowly back over the main ridge, and it was dark by the time we got down to the camp in the nullah bed. It had been a strenuous ten days. Unwashed, with the skin peeling off my face and a beard of bristles, I looked an unmitigated ruffian, and was aching in every limb. But I had made my debut as a shikhari, and not returned empty handed. I had learnt a lot, and improved beyond measure in getting about, and knew what it meant to rough it out shooting. Abdur Rahman and I had become friends, and he never left me again while in Gilgit, except to return to his village to cultivate his land in the off season. But I never got a chance of shooting another such markhor; the best I ever got was just over fifty inches. It is often the luck of the novice. I heard of that head several times again, but did not visit Duchin a second time. He was never accounted for in my time. The head of forty-four now hangs in the Staff College Mess at Camberley.

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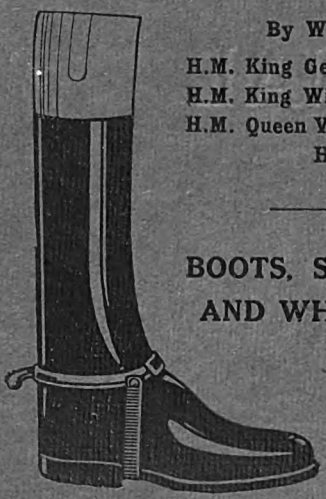

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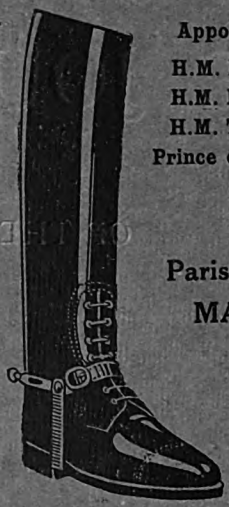

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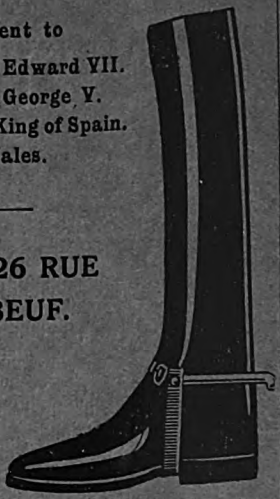
H.M. King George V.
H.M. The King of Spain.



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Sergt. Mulhall withdrawing a gun of 1st Troop, Bengal Horse Artillery (now "F" R.H.A.) near Kabul.

To face page 371.

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"DUNCAN" SILVER MEDAL ESSAY, 1928-29.

"What changes in equipment and training are necessary to enable Artillery in the Field to counter armoured fighting vehicles successfully."

BY MAJOR R. G. CHERRY, M.C., R.A.

"BAHUT BURRA SOOR."

INTRODUCTION.

THE influence of the tank on the later phases of the Great War, the technical advances made during the past decade in the design of all natures of cross-country vehicles, the trend of modern strategic thought and writings, all indicate clearly that the Armoured Fighting Vehicle is a weapon to be reckoned with to-day. Although measures have been taken, in the form of land mine and heavy machine gun, to stop the tank at close quarters, yet we must look also to the artillery of the field army to be ready to play its part, both in attack and in defence.

The artillery has, in this connection, two duties: The first, one of policy, is to provide the weapons best suited to engage, with the most suitable type of shell, armoured fighting vehicles at any and all stages of an action. The second, one of training, is to ensure that the personnel manning those weapons are so trained as to be able at all times to bring accurate shell fire to bear, at the right moment and in such volume that the effect of the fire will be decisive.

We should now consider the different conditions under which we may expect to meet the various types of A.F. vehicles which are in existence to-day, or may be evolved in the near future. These conditions are given in A.T., Vol. III, Sect. 37, which also lays down certain guiding principles of anti-tank defence.

It is there stated that light artillery may possibly form part of the defence in the area occupied by the forward infantry elements, but that field artillery should not be so employed. And here we may remark that there is an articulate desire for an artillery weapon in this zone. A later paragraph states that a

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second line of anti-tank defence in the area occupied by the artillery will be organized by artillery commanders. Both these precepts envisage direct fire at short ranges, from light artillery in specially sited positions and from field artillery in their normal battle position. In addition, artillery of all natures may be called upon to engage tanks by indirect fire at medium and long ranges with either ground or air observation. (As regards this indirect fire we may only hope to get good results in country where tanks are limited by the ground to restricted avenues of approach.)

When considering the occasions when direct fire may be called for, the problems are mainly technical, in that details of equipment are involved; when dealing with indirect fire the problems are mainly tactical, in that methods and procedure—that is to say training—come under review.

Direct fire—existing weapons.

Let us now consider what weapons we have at our disposal, capable of engaging fast moving targets by direct fire. Taking first the light artillery; we have only the 3·7″ howitzer, the present close support weapon of the field army. This gun can fire a 20 lb. shell at a maximum rate of aimed fire of eight rounds a minute; it has a 40° traverse with the split trail, is very handy in action, and can be made very mobile if mechanized. It was, however, never designed for anti-tank work and the carriage is not steady when fifth charge is fired at very low angles of elevation, such as would be employed when engaging tanks by direct fire at short range. If charges lower than fifth are used the trajectory is more curved, and the striking velocity lower. Moreover, considering the problem of ammunition supply in the forward area, it would be almost impossible in mobile warfare to keep an adequate supply up at the guns, if used for anti-tank work in positions that will necessarily be exposed. From the tactical point of view, the normal tactical siting of the 3·7″ howitzer in its role as a close support weapon is incompatible with its required siting as an anti-tank gun.

Turning to horse artillery, we have the obsolescent 13 pr., with its very limited traverse, and a maximum rate of aimed fire of about ten rounds a minute. In the field artillery we have the

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18 pr. Mark IV, all of which will shortly have platforms, the 18 pr. self-propelled and the 18 pr. Mark V. The 18 pr. Mark V is heavy in action, and has a traverse limited to 50°. The 18 pr. self-propelled is very expensive to manufacture, is too conspicuous for use in forward areas, is unsteady in action, and is, generally speaking, more suited to accompany an armoured striking force than to form part of, or supplement, the divisional artillery.

The 18 pr. Mark IV with platform, although more handy in action than the Mark V and steadier in action than the 18 pr. self-propelled, has, in common with both, certain disadvantages when considered as an anti-tank gun. These defects are due to the fact that it was never designed as such, and there are inherent in its design features that make for slowness in loading, laying and firing. There is a liability to loading jams when a very rapid rate of fire is attempted; split cartridge cases also occur. The firing lever is not suitably placed for No. 3, and, under present arrangements for laying and firing, a definite lag occurs. The general effect is to limit the effective rate of aimed fire, when laying direct, to twelve rounds a minute.

The only other anti-tank gun is the 3 pounder mounted in a medium tank, which forms part of the equipment of the Royal Tank Corps. This gun can be effectively employed in a tank versus tank engagement or to engage other targets at close ranges. It has not, however, much power, it is difficult to range owing to the poor visibility of its bursts, and it does not lend itself to co-ordinated fire.

Suggested changes.

Looking at the problem from the point of view of direct fire, we have two problems to solve: firstly, what addition is necessary to the light artillery to enable it to play its part in countering armoured fighting vehicles in the forward zone. In this zone we may expect to encounter perhaps armoured cars, and medium tanks, certainly light tanks, and motor machine guns—vehicles of varying sizes moving at speeds that may reach 30 miles an hour. The infantry will have a mechanized anti-tank machine gun which, we may assume, will be effective at short ranges. Their numbers are, however, at present limited to four per battalion: they will

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often be sited in positions from which withdrawal for the purposes of concentration at some threatened point may be difficult and costly; it would appear, therefore, that it may be advisable to supplement them by a weapon that has a longer range, a heavier projectile and is more mobile. In addition, we must not forget that we want a weapon in the forward zone that will engage aeroplanes flying between the low belt when they come under effective fire from light automatics, and the higher belt in which A.A. guns can deal with them. This belt is approximately between 2500 and 4500 feet, and the weapon that is most suited to do this appears to be a light gun sited in the forward zone, rather than a field gun sited further back.

In fact, the light gun will have to deal with fast moving targets on the ground or in the air, at short and medium ranges, and normally with direct fire. In considering the design of such a weapon, there are certain desiderata: the gun must be very mobile, it should move at least as fast as medium tanks so that it may accompany them; it should be itself armoured, and fire off a platform mounted on the chassis.

Being mobile and armoured, it becomes a weapon of opportunity and can move at short notice either to support our own tank attacks, to cover a threatened line of approach, or to take itself out of danger when its own fire discloses its position. Its calibre would depend on whether it is to follow the pom-pom principle, in which case it might throw a powder-filled projectile of about 3 lbs. or whether it should follow the principle of the anti-aircraft high velocity gun, in which case it might fire a high explosive shell of about 6 lbs., which is about the smallest shell in which a H.E. charge can be detonated. The pom-pom principle would permit of a great volume of fire on the target, with a certain sacrifice of accuracy. The smaller shell would allow of a much greater supply of ammunition. It would, however, probably be more liable to jam than a gun designed on the A.A. principle.

The H.E. 6 pr. shell would have a longer range, a higher muzzle velocity and penetrating power, but would probably need a larger detachment. The following features should be incorporated in its design: (a) semi-automatic breech mechanism, (b) short recoil, (c) sighting so that No. 3 can lay and fire, controlling both

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elevation and deflection, (d) all-round traverse, (e) elevation up to 60° As regards ammunition, for either type of gun, only one type of shell with a time fuze for A.A. work, and a delay percussion fuze for ground targets, will be necessary. Fragmentation should not be too great, especially from the point of view of its use against aircraft. As ammunition expenditure will certainly be great, provision must be liberal, and an ammunition trailer per gun will probably be necessary.

As this weapon will supplement the 3·7″ howitzer it may for a start be incorporated as a fourth 8-gun battery in the light brigades when these are mechanized. Experience will decide as to whether this will be sufficient for a division, or whether increase in mechanization will not call for the introduction of a complete light gun brigade per division. Another point for consideration is whether a light gun battery might not usefully form part of a cavalry brigade, whose activities will otherwise be seriously hampered by A.F. vehicles and low flying aeroplanes.

The second problem from the point of view of direct fire is how can we improve our existing field gun as an anti-tank weapon, and when laying down conditions for a new field gun, what considerations should be kept in view. Mention has already been made of the defects of the 18 pr. generally. Such defects will be considerably minimised by the general introduction of the platform. Moreover they are serious only when a rate of fire of more than twelve rounds a minute is attempted. In theory it is sound to lay down the principle that this rate should not be exceeded, but in the case of a tank attack which has broken through the line and is threatening to over-run a battery position, attacking from the front and both flanks, the guns will undoubtedly fire as fast as it is humanly possible. It is at such a critical stage that mechanical failures are most likely to occur. The platform drill will eliminate lag as soon as the layer is provided with a graticuled Aldis sight and a more suitably placed firing lever.

As regards design of a new gun, care should be taken to avoid the known defects of the 18 pr. It must, of course, have a platform, be handy in action, have an elevating, traversing and sighting mechanism so designed that No. 3 can lay and fire without being over-burdened. The guiding principles, however, always remain, and they are speed, simplicity and reliability.

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Indirect fire.

It was stated earlier that the problems connected with indirect fire against armoured fighting vehicles were mainly tactical. There are, however, certain technical desiderata which arise from the normal tactical conditions.

Range.

The most important of these is the question of range. In the battlefields of the future we shall be concerned with frequent movements of mechanized vehicles by day behind the contact zone. Such vehicles may not be armoured, but they will be targets of importance, and the problem of how to hit a collection of cross-country vehicles is the same whether those vehicles are armoured or not. It is true that in certain theatres, these movements will be seldom visible to our O.P's, but in theatres of operations where dominant features are available as O.P. areas, we may have great opportunities to bring fire to bear on enemy movement on roads or across country at long range. Further, the air gives us an O.P. that is independent of all ground features, is available in all theatres of operations, and, in a good light, gives a wide range of visibility. We must therefore be in a position to answer calls from the air against targets at ranges longer than we contemplate at present, and which are also not the extreme ranges of the weapons concerned.

Ammunition.

Mechanization generally, and the appearance of armoured fighting vehicles on the battlefield in particular, will lead to a readjustment of our proportions of H.E. and shrapnel carried in the field. Shrapnel is of little use against armoured vehicles, though its effect against troops in unprotected vehicles would be considerable. There is, however, no need to make a drastic alteration in the existing proportions carried now, or used at practice camps. Practice shoots against tanks, whether by direct or indirect laying must be carried out with percussion shrapnel, as the latter does less damage to the targets and allows a bigger margin of safety for the personnel operating moving targets. A liberal supply of shrapnel is, therefore, necessary in peace for practice purposes.

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If war breaks out against an enemy that uses armoured fighting vehicles, there will be a demand for an increased proportion of H.E. There will be the less difficulty in meeting this demand as H.E. is cheaper and easier to make than shrapnel. It is suggested that the proportion of types available as mobilization might be amended now to H.E. 50%, shrapnel 38%, smoke 12%.

Proportion of guns and howitzers.

This is a very big question about which there is no finality of opinion. It is considered, however, that a readjustment should not take place (a) until a new field howitzer is produced that has a range equal to that of the field gun, and can fire at a rate of at least six aimed rounds a minute; (b) until the light gun is produced that will definitely preclude the detachment of field gun sections or single guns for use in the forward zone.

Existing methods.

We should next consider our existing methods for answering a call for fire on armoured fighting vehicles from a battery under cover using indirect fire. Take the case of a battery commander who is at an O.P. that has considerable command. Artillery Training, Vol. II, has not much to say, but it is perhaps worth quoting: "The principle employed is, by knowledge of the line, range and angle of sight to as many points in the zone as possible, to prepare a burst of fire for a future probable position of the target, and to bring it down at the right moment. For the next and subsequent bursts of fire there is choice between correcting on the result of the last burst, allowing for the movement of the target, or preparing the fire afresh." The regimental officer is given here a good guiding principle, which allows him considerable latitude, but gives him very little help towards solving the undoubted technical difficulties of the problem. These difficulties are that the officer controlling the fire has to correct his M.P.I. with reference to a probable future position of the target (that is to say, to some point on the ground) and at the same time he has to keep the target under as rapid a rate of fire as possible during the limited time which it is in view. Without further aids, an average commander of an 18 pr. battery may be expected to

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put down about five bursts of gun fire in a target run of 1500 yards. If his zone has been well registered and if the target comes within view near a registered point he ought to get his first burst near it, but, even so, if the target is on a course that makes an appreciable angle with the line of fire, he usually finds it difficult to keep on the target for both line and range. If the target appears in an unregistered part of his zone, he usually takes some time to get a burst close to the target.

Suggested improvements.—Tables.

Simple tables, showing the appropriate changes in range and deflection for different presentations of the target, are useful in so far as they enable the B.C. to give out orders that bear a close relation to the rates of change of range and line, and it has been found that a B.C. who employs one of his staff to call out such alterations from the tables, can work to a quick time interval, increase his rate of fire, and, if he once gets his M.P.I. correct, can keep it on or near the target.

The use of tables, however, does not quite enable us to reach our ideal, which is to put down a continuous fire on the target, even during periods when it cannot be seen from the O.P. This could be done if the B.C. possessed and could pass to the guns, for use at the guns, information regarding the rate of change of range and deflection of the target relative to the guns. This is done in the Navy by electrically connected instruments, but the addition of such instruments to a field battery is to be deprecated. Battery staffs are already overloaded, and no form of bulky instrument should be added, at any rate until mechanization is complete.

Rate clocks.

Possibly the best solution lies in the introduction of rate clocks for range and deflection at the gun position. The B.C. would estimate the target speed and presentation, look up his table (see Appendix A) and read off the appropriate rates of change of range and deflection. These he gives to the gun position—as for example—"Rates Deflection 6 Range 4." Deflection and elevation are then continually altered at the battery in accordance

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with the rates ordered, taking into consideration also the time of flight. The muzzles of the guns are thus moving at short time intervals in the horizontal and vertical plane in accordance with the estimated movement of the target.

The B.C. has to concern himself with (a) correcting his M.P.I. on to the target, which he does by giving ordinary range and line corrections, (b) keeping on the target, which he does by altering either or both of the rates. Fire, meanwhile, can be continuous at a quick rate of battery fire, which is easily controllable and makes for steadier laying than gun fire.

These rate clocks could be worked either as:

(a) A deflection rate clock suitably mounted on the left of the gun so that No. 3 can traverse, in accordance with the pointer. A range rate clock suitably mounted on the right of the gun so that No. 2 can put on increments of range; or

(b) Both clocks mounted on a small dash board kept at the command post, set by the G.P.O. and operated by one of his staff, who would call out changes in deflection and range when indicated by the clocks.

The advantages of the former system would be (i) that each gun follows up independently and accurately the changes in deflection and elevation, (ii) that there would be very little extra noise at the gun position. This system does, however, add to the duties of Nos. 2 and 3, and gives extra sources of error.

The advantage of the latter system would be that the procedure would be centralized and controlled at the command post; it would however entail considerable passing of orders, some of which might not get through when a rapid rate of fire was employed. It is suggested that the alternatives should be tried out, to ascertain which method gives the best results.

It is considered that 100 yards should be the unit for range increments and 30 minutes for deflection increment. This type of target is an "area target" and fine adjustments for line and range are not necessary. The clocks having been set to the appropriate rate on the gramophone retarder principle, a pointer would revolve round a clock face graduated in 30 minutes for deflection and 100 yards for range. A study of the suggested rates shown in Appendix A will show that this method might be expected

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to work for all presentations except rapidly crossing targets at short ranges, when the deflection rate would operate too quickly. This rate principle would apply to all field and medium guns and howitzers. In the case of the latter, the influence of the time of flight on the rates will be more important than for guns.

Concentrations.

The next consideration is the possibility of putting down observed and controlled concentrations of fire from more than one battery on to important formations of armoured fighting or other cross-country vehicles. The question of putting down and controlling fire concentrations has been recently considered in the light of developments in survey, and a short summary of its possibilities may here be given so as to show how the logical development of this line of thought may lead to important progress towards the systematic engagement of moving targets by the concentrated fire of a brigade. Given good communications—and it must be postulated at once that the officer controlling the fire of a brigade must be able to speak to all batteries simultaneously—and given survey to the point where all battery positions are on the same grid, the co-ordinates of a target found by one battery ranging can be passed to the remaining batteries of the brigade, and used by them to plot or calculate line and range. The line and range so obtained may not be accurate, the most probable source of error being in the height of target as found by the ranging battery from its angle of sight.

As this type of target is an area target, the error will probably not be serious, in normal country, but in hilly country where large angles of sight are employed, the error will be more likely to occur and more serious in its effects. Therefore to enable the brigade commander (or the officer detailed by him to control the fire) to correct this and other errors, some method must be evolved whereby the fire of these batteries can be corrected before the concentration takes place. This may be done by calling on each battery in turn to fire a round of gun fire at a stated interval, each salvo being corrected by an OM clock code correction sent down to each battery from the controlling O.P. One correction should suffice to bring the M.P.I. of each battery on to the target.

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This method of fire may be called "brigade fire." To complete the picture, let us consider the situation when all batteries of the brigade have been in action for some time, and survey is complete to the point where gun position and O.P. areas are on the same grid. Targets have been fixed from one or more O.P's, and the whole result of the survey operations is computed or plotted on the fighting maps. Under these conditions the co-ordinates of a target can be sent to all gun positions from a controlling O.P., and if the situation permits, the line and range worked out by each battery can be corrected by a round of brigade fire, though this check should, under such conditions, not be necessary.

Application to moving targets.

We must now consider how to apply these principles to targets which may be stationary or moving slowly when first engaged, but will probably increase speed and change direction when heavy fire comes down in their vicinity. It is assumed that the target is of sufficient importance to warrant a concentration. It will of course be necessary to lay down guiding principles on this point, as it is clear that a target less than a company of medium tanks could be engaged more quickly and accurately by a single battery. It might be laid down that a moving target whose frontage and depth exceeded 200 yards would warrant a concentration upon it. There will be no time for accurate ranging, even by one battery, so that there will have to be a certain amount of previous registration either instrumental or by shooting, which we may now consider against the different stages of survey progress.

(a) When no survey data are available; all batteries will have to register their zones, especially certain reference points shown them by the brigade commander, who will have to indicate the target by a clock reference from the registered point nearest to it.

(b) When gun positions are on the same grid; here we envisage the kind of situation that arises where one battery has been in action, perhaps in support of the advanced guard, and has considerable knowledge of its zone.
When the brigade commander is ordered to bring the

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remaining batteries into action in the vicinity of this battery, the brigade survey party will at once proceed to put the three battery positions into sympathy with the battery already in action.

Should the target appear near a registered point, co-ordinates can be given to these other batteries without a ranging round being fired. Should it, however, appear in an unregistered portion of the zone, the battery will have to fire two ranging rounds and pass the co-ordinates so estimated to the remaining batteries.

(c) When gun, O.P. and target areas are in sympathy; in this case the brigade commander sends co-ordinates to all batteries, who work out their line and range.

Two questions now arise (a) On what point should the controlling officer bring his first crash? In all cases his clock reference from the registered point, or his co-ordinates, must refer to a point in the predicted path of the target, and the location of that point with reference to the present position of the target, will depend on the time he thinks batteries will take before they are ready to open fire. (b) What form will the initial crash take. Will it be a round of brigade fire or a simultaneous crash? When no survey data is available, the answer will depend on the closeness of the target to a registered point. If gun positions only are in sympathy, a round of brigade fire at a quick interval would be desirable. If survey is complete, fire can open with a crash from all batteries. The brigade commander's decision will also be affected by such considerations as the desirability of getting surprise effect from the start, and the size of the target compared with the probable errors in battery prediction.

Control at fire for effect.

Having reached this stage, we have now to consider how the fire can be controlled at subsequent fire for effect so as to conform with the movements of the target. We can adapt the FG method of conducting shoots against moving targets with air observation. The officer at the controlling O.P. would give his OM corrections with reference to a point he expects the centre of the target to reach in (say) two minutes after the first crash or the first battery's salvo at brigade fire. His next order would be "Fire by order

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two rounds gun fire", and as the target approached the predicted spot "Fire." His further procedure would be to give an OM correction from the mean centre of the bursts to another point in the predicted path of the target, e.g. "OM C3 Repeat - - - Fire."

This method has certain disadvantages. It is by no means easy for an observer, unless he has very good command, to make an accurate prediction. He has to pick a certain spot on the ground which he thinks the target will reach after a certain period of time; he has to visualise this spot as the centre of a clock, in which twelve o'clock is grid north; and finally he has to give to the centre of a group of rounds an OM correction to bring the next burst to this spot. If these two rounds of gun fire fell, as they should fall in theory, in two little bunches, then it would not be so difficult to give a prediction the accuracy of which would depend on the observer's skill in visualising his clock. But in practice these rounds will usually fall in eight groups so well separated that the observer will obtain a rough indication only.

Now let us imagine that the principle of rate clocks, as already explained, was established as a method of engaging fast moving targets. The officer at the controlling O.P. would have a much easier task. On the appearance of the target he would broadcast co-ordinates of a spot that the target would reach in (say) two minutes, followed by rates of change of deflection and range. Batteries would apply these rates at the expiration of two minutes. The same rates would usually suffice for all batteries, unless they were very widely dispersed, in which case it might be necessary to send down different rates for the flank batteries, as the target would offer a different presentation to each of them. The line and range of each battery might be checked with a round of brigade fire, and the general tendency of the bursts would give the controlling officer a good indication as to the accuracy of his rate predictions. He would, in fact, give out an OM correction to each battery followed by an alteration in either or both rates.

All batteries would then proceed to a specified number of rounds of battery fire, thus keeping the target under a steady and continuous fire. The controlling O.P. would watch the general effect, controlling it by altering either rate. If the fire became inaccurate, probably owing to a big change in direction by the

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target, battery fire could be stopped at once, an OM general correction given and the lines of individual batteries checked, if necessary, by another round of brigade fire before the resumption of battery fire, perhaps with altered rates. Again it is emphasised that good communications are absolutely essential for this form of shooting, and it is suggested that the introduction of R/T will greatly facilitate control of concentrations from O.P's which may be at considerable distance from the guns.

Air observation—general remarks.

It will hardly be disputed that formations of armoured fighting vehicles, or cross country transport, will not be able to move by day in open country without exposing themselves to aircraft flying about or below 6000 feet. Considering, therefore, that an infantry division is entitled to expect to have, during operations, one A/R machine up continuously on its front, the opportunities for dealing with the movements of enemy mechanized units appears to be very great.

Lack of practice.

The amount of actual practice of aeroplane shoots with live ammunition is very limited, possibly owing to the fact that the ammunition so expended has to come out of the year's practice allotment, payment for which comes against the Army budget. From the R.A. point of view, aeroplane shoots are of the nature of a routine; no tactical lessons are learnt, but seldom can the fall of shot be seen by any of the battery personnel, and in fact the only lessons that the battery can learn from any one shoot are the importance of strict adherence to drill, and the unfortunate results that usually ensue, if KT is missed through slowness or mistakes in the gun position. The result is that the standard of shooting, especially in the case of FG shoots against moving targets, remains very low. Much more practice is undoubtedly required in this form of shooting, and the results should, whenever possible, be checked by accurate range reports.

Communications.

Inter-communication, so far as all batteries except heavy batteries are concerned, is still restricted to one way W/T from

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aeroplane to battery, and ground strips from battery to aeroplane. This means that inter-communication, even of this primitive nature, can only take place in the case of allotted batteries. In mobile warfare, and especially in the early stages of an action, there will be few opportunities of arranging for allotted batteries and shoots that take place will usually be impromptu. Even when pre-arrangements can be made and batteries are allotted, the airman and battery must adhere rigidly to the codes laid down in Artillery Training, Vol. II, Ch. X, para. 76. The introduction of two-way W/T or R/T would greatly minimise the risk of failures of shoots owing to lack of understanding, and will admit of more elastic methods which will themselves make for progress.

Type of machine.

In the present type of A/R machine the pilot has to fly the machine, operate the W/T, pick up the target, read its co-ordinates, "clock" the target, observe fire upon it, and send messages and corrections to the battery. It is not surprising therefore that the procedure of aeroplane shoots must be kept very simple.

Alternative types of machines are, however, in existence and could be utilised for A/R work.

(a) A three-seater in which an artillery observer could sit in front of the engine, from which position he is ideally situated to shoot the battery. There is no technical reason why a three-seater could not be designed that could be used on advanced landing grounds. It is argued that financial considerations preclude the use of such machines, but expense would be to a considerable extent lessened by the employment of N.C.O. pilots in A/R machines. The observer must be an army (preferably an artillery) officer.

(b) An auto-giro, which can maintain an almost stationary O.P. at any height and in any position relative to the battery. This type of aeroplane can also fly low or even land at the battery position without undue loss of time.

Either type of machine would, in the writer's opinion, be preferable, from the R.A. point of view, to the type now used for this work.

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Loss of touch.

It was inevitable that the R.A.F. would develop its own line of thought, but we must ensure that such progressive thought is maintained that will keep methods of co-operation abreast with the times. The increase of mechanization has put a great weapon into the joint hands of the R.A. and R.A.F., which weapon should be exploited by a thorough reconsideration of the situation, and an exploration of all means whereby the R.A.F. can take full advantage of the increased power given to the R.A. by survey, radio telephony and—in the future—by increased range.

Existing methods.

We must, however, consider the situation as it exists at the moment, examine our existing methods of co-operation and see how they can be improved, by utilising the material that the R.A.F. puts at our disposal. We have three fire calls which can be employed to bring fire to bear on moving targets. (a) The FG call for observed fire by group of rounds from a single battery. (b) The LL call for heavy concentrations. (c) The ZZ call for predicted fire, which will not be corrected by the aeroplane. Predicted fire is all very well, but unless its effect is observed and corrected, it leads to considerable waste of ammunition. A commander who orders predicted fire should, whenever possible, be able to ascertain immediately if his fire is successful. It will be appreciated from the description of these three calls that there is at present no method of calling for observed fire from more than one battery. Of the existing calls, it would appear that the ZZ call hardly justifies its existence, at any rate until the units answering this call have completely fixed their gun O.P. and target areas by survey. When it is remembered that the airman has to estimate co-ordinates of a point in the probable path of the target, and has usually only a one-inch map for the purpose, it will be appreciated that effective results can hardly be expected from a ZZ call. Now the same principles of controlled concentrations can hold good for air observation as they do for ground observation, and the same methods can be adapted to allow for fire to be corrected on to the target.

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Suggested improvements—concentrations.

It is suggested, therefore, that the ZZ call be changed :—

(a) Into ZZ OE which calls for fire from a single battery by single rounds on to a stationary target, followed by a round of brigade fire corrected by OM corrections from the air, before the brigade goes to fire for effect.

(b) Into ZZ FG which calls for fire by a group of rounds from each battery in turn on a moving target that covers an area greater than could be dealt with by a single battery. These rounds are corrected by OM corrections with reference to a point in the target path.

After this round of brigade fire, batteries could fire simultaneously on the airman's KT, and the airman would give a general OM correction after each round of brigade gun fire with reference to the next point in the target's path.

An example would explain the procedure : the airman seeing an important armoured fighting vehicle formation, sends the call ZZ FG and the co-ordinates of a spot he expects the target to reach in four minutes. As the target approaches the spot he gives KT, whereupon each battery fires a round of gun fire in succession at (say) 10 seconds interval. Each crash is corrected by the airman as it falls with reference to a point the target is expected to reach in two minutes. Then as the target approaches this spot, the airman gives KT, and one or more rounds of gun fire (according to the importance of the target) is fired by batteries simultaneously. The airman gives a general OM correction to a point one minute further on in the target path.

It will be noticed that the main drawback to this procedure (apart from the great difficulty of predicting accurately to an imaginary future position of the target) is the long period between the moment the airman picks up the target and the moment—six minutes later—when the first concentration is fired against it. Armoured fighting vehicles moving at ten miles an hour would have moved one mile in this time interval. Against this criticism we may say that the airman may often pick up a target while it is still out of range of the brigade, so that this long time interval will not always represent time wasted. Again, if survey has been complete and accurate, and if the target covers a wide area, such

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as would be covered by a tank battalion, it may be possible to dispense with the round of brigade fire, and to put down the initial crash from all batteries at the expiration of the first four minutes. A convention could be arranged to suit such cases, and it is suggested that when brigade fire is used, each 18 pr. battery fires one round of smoke in its round of gun fire. When brigade fire is dispensed with, smoke will be unnecessary and may therefore be omitted. Here is a possible method of conducting an observed and corrected concentration on the FG principle. But, owing to the difficulty of predicting ahead, a simple FG shoot with one battery is seldom successful unless the target is tied to a definite avenue of approach. We cannot, therefore, with existing methods hope for much success when more than one battery is involved.

If, however, the rate principle were adopted, instead of the F.G. principle, the airman's task would be much easier, and the rate of fire could be increased. For he could, if trained to do so, appreciate with sufficient accuracy the presentation of the target; he should, with the help of his map, be able to make a rough estimate of the target speed. If he makes a bad estimate of presentation and speed, it does not matter, as he can correct them later. His procedure would be as follows: He would send (i) co-ordinates of a spot he estimates the target will reach in two minutes, (ii) direction of movement, (iii) rates for deflection and range. The battery rate clocks are set at the expiration of two minutes and brigade fire started on the first KT. The airman would adjust the M.P.I. of each battery *on to the target* and thereafter give general OM corrections only if the general effect of the fire goes off the target owing to a big change of direction. He would give alterations to either or both rates if they were not making the correct allowance for movement. Fire would be continuous, and corrections to the fire could be given without interrupting it.

This method is of course applicable to the ordinary FG shoot against a moving target and should make this type of shoot quicker and easier to control, besides eliminating the time intervals that occur between bursts of fire. It is emphasized that the great advantage claimed for the rate method is that it eliminates, from the moment fire begins, prediction to a point in the target path.

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It is believed that the R.A.F. would welcome this suggested method of engaging moving targets.

Summary and conclusion.

The subject has now been considered from several different points of view and under varying conditions. Suggestions have been put forward:—

(a) To meet the want of a light artillery weapon in the forward zone which can engage fast moving targets on the ground and in the air, and will prevent calls being made on the field artillery to detach sections or single guns for this duty.
(b) How the 18 pr. falls short of the ideal field gun as an anti-tank weapon, and how defects may be overcome in the future.
(c) To quicken the procedure and increase the volume of fire from a single battery engaging armoured fighting vehicles from under cover.
(d) To introduce the principle of corrected concentrations from a brigade against armoured fighting vehicles from under cover.
(e) To improve co-operation with the R.A.F. generally.
(f) To introduce the principle of corrected concentrations from a brigade against armoured fighting vehicles with air observation, and to amend existing procedure to bring it into line with suggestions (c) and (d).

With the exception of the first of them, the suggestions put forward call for no great expenditure, no radical change in our existing policy. The introduction of the rate principle may be expected to quicken the rate of fire from a single battery, and to simplify greatly the procedure for brigade concentrations with ground O.P. It should both quicken and simplify FG shoots and would make a ZZ FG shoot a very practical proposition. The suggestions can be tried out during training, are capable of amendment in detail, and when they have proved their use, they can be incorporated in our training manuals. As the motto of this essay suggests, our opponent is a very big boar, and the military equivalents of a sharp spear, a blood horse, and the co-ordination of brain, eye and muscle are necessary if we are to defeat him.

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APPENDIX A.

RATE CARDS—18 PR. FULL CHARGE.

TARGET SPEED—10 MILES PER HOUR.

(a) *Deflection rate.*

Range	Angle to Line of Fire				
	15°	30°	45°	60°	90°
	Rates				
8000	2	4	6	7	8
7000	2	5	7	8	10
6000	3	6	9	10	12
5000	4	7	10	12	14
4000	5	9	12	15	16
3000	6	12	16	19	25

Rate Equivalents

Rate	Deflection in time.	
1	30′	120″
2	30′	60″
4	30′	30″
8	30′	15″
16	30′	7½″
20	1°	13″
24	1°	11″

(b) *Range rate.*

Angles to Line of Fire.	Rate.	Rate Equivalent 100 yds. in secs.
75°	2	80
60°	4	40
45°	6	30
30°	7	25
15°	7	25
0°	8	20

(c) *Time of flight.*

Range.	Time of Flight. secs.
8000	29
7000	23
6000	18
5000	14
4000	11
3000	8

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ANTI-AIRCRAFT PRACTICE IN PEACE.

By Captain V. R. Krohn, m.c., R.A.

FROM time to time articles on various aspects of the Anti-Aircraft problem have been published in this journal, but in none of them has there ever been included a detailed description of the methods of anti-aircraft practice during peace time. It is felt that this is such an important feature in anti-aircraft work, that a short article on the subject would be of interest to the Regiment as a whole, particularly in view of the fact that anti-aircraft defence is becoming of greater importance every day. The subject can be most conveniently classified under two main headings, viz. :—

(a) Methods of practice.
(b) Methods of analysis.

The Range.

The 3-inch 20 cwt. anti-aircraft gun has a maximum ground to ground range of about 11,000 yards, so that a practice range must be at least 12,000 yards long. Aeroplane targets will approach the defending guns from any point of the compass, so that the ideal range would be a circular area of 12,000 yards radius, which represents about 145 square miles. This sort of range is obviously impossible on land, but might be obtainable at sea if practice took place from an island. In actual fact the all-round arc of fire is not essential, but an arc of not less than 150° should be aimed at. The reason for requiring this large arc is due to the great speeds at which A.A. targets travel. At a medium ground range of, say, 4000 yards, a hundred mile an hour target will travel the 30,000 yard course enclosed in a 150 degree arc in ten minutes and any faster target in a proportionately shorter time. This means that on a range with a smaller arc of fire a great deal of valuable time is lost to the gunners practising, while the target is turning at each end of the range and getting back on to its course. The next vital point, which is a strictly practice camp consideration, is that of the visibility of the target. It is very difficult to pick up a target when looking towards the sun, and although this is a difficulty which

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will be encountered on service, it is merely a waste of time to introduce it in practice. A.A. ranges are therefore chosen to face north in the northern hemisphere and south in the southern.

Certain limitations affect the choice of a range and it might be well to tabulate them at this point. The principal requirements are :—

1. Over the sea.
2. Ground range limit 12,000 yards.
3. Arc of fire as large as possible, say 150 degree, though the larger the better.
4. Facing away from sun.
5. Locality where there is an absence of shipping traffic.
6. Interference with fishing should be avoided.
7. Alternative gun positions should be available.
8. Land for camps should be available, convenient to gun positions.

A few more minor points have been added to the list, and there are others which will occur to the reader, but the first four are essential, while 5 is important as existence of shipping traffic across the range wastes valuable time.

Methods of Practice.

The ideal target.

The ideal target would obviously be the wireless controlled pilotless aeroplane which could be engaged by means of direct fire. Although this method has been discussed from time to time, it has almost always been turned down on the score of expense. The small aeroplane costs complete something like £350. If we add to this another £100 for the cost of the wireless control gear, there is very little change left out of £500. These small aircraft are only capable of about 80, and perhaps under favourable conditions, 100 miles per hour. What we really need is a target which will give us speeds which approximate more closely to those likely to be attained by hostile aircraft in a future war, that is from 120 to 200 miles per hour. The cost of a target capable of these speeds would be nearer £1500 than £500, and therefore in these days of financial stringency, this form of target has not got beyond the discussion stage. There are further difficulties in connection

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with such targets. For instance, the control apparatus may be hit and put out of action but the target may be otherwise undamaged. We would then be faced with the problem of a pilotless aeroplane flying about until the petrol supply is exhausted, when it would undoubtedly crash in the main street of the nearest town. Again the question of landing such a target is not an easy one, even when under complete control. It would presumably be landed on the sea, but even then the chances of damaging some part of the undercarriage or delicate wireless control gear are very great. It is not suggested, however, that either of these objections are insuperable, but they exist at the moment, and unless a real demand for such a target arises it is doubtful whether serious attempts will be made to solve them.

Full charge practice.

By this is meant practice carried out with the full service charge of 2 lbs. 2 ozs. 10 dr. of cordite, giving a muzzle velocity of 2000 feet per second.

Owing to the difficulties connected with the use of a pilotless aeroplane as a target, a towed sleeve or "drogue" target is used. In this method, a fabric sleeve, conical in shape and about 20 feet long is towed on the end of a cable 6000 feet long, by a fairly powerful aeroplane. The sleeve is about 5 feet in diameter at the front end, tapering to about 3 feet at the other, and is open at both ends to allow the air to pass freely through. It is sufficiently tapered to allow the passing air to blow it out into shape, but the open ends reduce the resistance sufficiently to enable speeds of about 100 m.p.h. to be obtained. The use of such a target entails the fitting of several aeroplanes with special winches and launching gear, and the R.A.F. personnel have to be specially trained for the work. The launching of the drogue is carried out in the air. The drogue is packed in a special manner, weighted with sand and stitched lightly. On being launched, the heavy sand causes it to fall rapidly and on being checked by the cable the stitches break, and allow it to open out. The cable is carried on two drums, the first and smaller one carrying 600 feet which is used during launching. As soon as the sleeve opens out satisfactorily, the remaining 5400 feet can be paid out. Revolution

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counters show the amount of cable in use, and powerful braking is provided for control purposes. On returning to the aerodrome, the 5400 feet of cable are reeled in by means of the winding gear operated by an auxiliary air screw, which is driven by the slip stream currents. Just before landing, the sleeve together with the remaining 600 feet of cable is dropped on the aerodrome. In an emergency, the cable can be cut, and so free the towing aeroplane from the retarding influence of the heavy cable and drogue. Owing to the weight of the cable and drogue, the latter flies at about 1000 feet lower than the towing aeroplane, but as the drogue itself is treated as the target and all measurements are taken on it and not on the towing aeroplane, this is not a serious inconvenience except from the point of view of observation of fire, which will be referred to again later.

Safety precautions.

As the drogue target is engaged by direct fire, it is essential that adequate arrangements should be made to ensure the safety of the airmen in the towing aeroplane. This becomes even more important when using the service high explosive shell instead of the powder filled cast iron practice shell which has been used hitherto. The safety precautions adopted are, briefly, as follows :—

1. The target is towed backwards and forwards across the range, and no firing is permitted on an approaching or receding target.
2. Fire may not be opened until the drogue itself is within the prescribed limits of the range.
3. Fire may not be opened if any gun barrel is pointing within 5 degrees behind the towing aeroplane.

   Both 2 and 3 are ensured by posting an officer behind each gun, who, by means of a pre-arranged flag signal, indicates when fire may be opened.
4. As soon as any of the safety precautions are, for any reason, not complied with, fire can be stopped by any or all safety officers by a blast on a whistle.

   Up to the present these precautions have proved simple and effective in working.

Apart from the counting of direct hits, if any, or the actual

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bringing down of the sleeves, records of every round fired are kept, but this will be dealt with later on.

Burst short practice. More popularly known as reduced charge practice, is the only other form of practice in use at present. In this case the muzzle velocity of the shell has been reduced, by adjusting the weight of the propellant, from 2000 feet per second to 800 feet per second. This has had the effect of reducing the maximum height attainable by the shell, from about 21,500 feet to about 7900 feet. The charge and muzzle velocity selected are such that for a given fuze setting using the reduced charge, the time of flight is the same as that for the same fuze setting when using the full service charge, to within 5 or 10 per cent. In this form of practice the aeroplane, which is itself the target, is made to fly at any height above 8500 feet, and as this is outside the envelope of the gun when using the reduced charge, the safety of the airman is assured. Certain scales on the guns and instruments have to be changed—notably the tangent elevation scales, which must obviously be different—but in other respects the drill for both instrument and gun detachments is in no way different to that required when using the full charge. Furthermore, the times of flight for given fuzes, being for all practical purposes the same, all deflections for travel are of the same order as for full charge, so that this form of practice does not tend to give the A.A. gunner a false idea of the value of the deflections required.

An effective burst, subject to certain considerations referred to later, is one which occurs on the line of sight from the gun to the target, at the moment at which the burst occurs. The observation of anti-aircraft fire is difficult to the untrained observer, on account of the speed of movement of the target relative to the burst from a shell. The shell burst remains stationary but the target continues to move away from it at a speed which may vary between 50 yards and 100 yards per second. It is necessary therefore, that observations should be instantaneous to be of any value as a record for effective shooting. While with this method it is impossible to obtain a direct hit, it has the great advantage of allowing the target aeroplane complete freedom of manœuvre at heights above 8500 feet, with the result that practice can be obtained against a target travelling on any course relative to the

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guns, whereas with full charge practice the target is restricted to a crossing course as previously stated.

These two are the only methods of practice at present in use in the service, but between them they give fairly satisfactory all-round training to A.A. units. It is hoped, however, that at some time in the future the ideal target referred to at the beginning of this article, will be available, as then, and only then, will it be possible to obtain in peace time reliable data as to the efficiency of modern anti-aircraft fire.

Methods of Analysis.

It may be well at this point to state briefly how anti-aircraft fire is carried out. There are two main methods, which will be used under service conditions, and these are known as Case I and Case III. In this article it is only necessary to mention how many at a time, and at what rate, rounds are fired. The fire unit may consist of two or four guns. With the Case I method fire is carried out in groups of four rounds from each gun, at an average rate of fire of about 20 rounds per minute. This means that with a 2-gun fire unit an observer may have to record the positions of 8 rounds in 9 seconds, and with a 4-gun fire unit 16 rounds in 9 seconds. With the Case III method of fire, the fire units may be of the same size, but theoretically there is no need to fire in groups of four rounds, and in fact fire could be continuous. On the grounds of economy in ammunition, however, it is probable that fire will be carried out in groups of about 4 or 6 under most circumstances. The firing of single rounds is not a normal service condition, though this is carried out in special trials, where accurate records are of vital importance.

In order to obtain a full analysis of anti-aircraft practice fire the ideal to be aimed at is obviously to ascertain the position in space of each burst relative to the target. Unfortunately, however, this ideal is exceedingly difficult to achieve for two main reasons, viz. :—

(a) The great speed of the target.

(b) The rapidity of A.A. fire.

This combination of factors has so far made it impossible to make the necessary measurements for obtaining the ideal. In fact, were it possible to make such observations for analysis purposes,

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it follows that similar methods of measurement would be available for the control of anti-aircraft fire, which would then reach a state of efficiency which is beyond the dreams of even the most optimistic gunner.

Up to the present, therefore, we have had to be satisfied with very much simpler methods of observation, and these can be classified as follows :—

1. Observations for accuracy as to line.
2. Observations for accuracy as to fuze.
3. Observations for accuracy as to height.

Considering these separately :—

1. *Line.*

It is required to find the displacement of bursts (single rounds) relative to the line of sight from gun to target at the moment at which the burst occurs. Any observations must of course be instantaneous or as nearly so as possible as already explained. This observation is achieved by the use of a camera obscura of a special design. The camera, fitted with a telephoto lens, is mounted on a stand in such a way that it can be laid accurately on to the target, by two independent layers, one for elevation and one for training, the optical axis of the camera being aligned with those of the layers' telescopes. A third man acts as observer, using a special eyepiece which allows him to look into the camera and view the image of the target on a specially prepared target card. There is a hole in the side of the camera fitted with a suitable sleeve shield to keep out the light. The observer puts his right hand into the camera through this sleeve in readiness to mark, with a pencil, the points at which bursts occur.

The cards are marked in circles similar to the ordinary rifle target, the smallest of which represents a radius of half a degree round the line of sight, the others being one, two and three degrees radius. Five groups of fire can be recorded on each card, by means of different signs for marking the bursts in each group.

With a well-trained observer, the lag in time between the appearance of the burst and the actual marking of the card should not exceed half a second, which represents 25 yards error for a hundred miles per hour target. In practice it is probable that the error is much less than this, as the observer will instinctively note

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the actual point on the card at which the burst appeared, even though he does not make the mark immediately. In making the actual analysis of the shoots it has been customary to allow all bursts within the half-degree circle, as effectives, but strictly speaking this is not correct, as the value in yards of this half-degree circle varies with the range, i.e. at 6000 yards line of sight range half a degree represents 50 yards, whereas at 3000 yards it represents 25 yards. We know that our 3-inch 20 cwt. H.E. shell weighing 16 lbs. has only a radius of effect of something like 10 yards if we want to make certain of doing real damage. On the other hand, there is always a chance of a shell fragment hitting some vital part of the aeroplane or pilot at well over 100 yards, so that the assumption of bursts being effective within the half-degree circle is not unduly optimistic. Furthermore, 6000 yards is a long range for the 3-inch 20 cwt. gun. At 3000 yards where the half degree represents only 25 yards, the assumption is definitely a fair one.

2. *Fuze.*

The next point to be considered is that of fuze. In A.A. gunnery the sights are so arranged that whatever fuze is ordered to the guns, the correct tangent elevation to produce a burst on the line of sight with that fuze, is automatically applied. This being so it is possible to fire with an entirely wrong fuze, and yet obtain a burst on the line of sight, providing the deflection for travel of target were also wrongly calculated. This may seem a little complicated at first sight, and it may be well to go into the matter a little more fully, by giving an example. Let us take the simplest case of a directly approaching target. In this case we only require a deflection for travel in one sense, i.e. the vertical sense, and the lateral deflection is NIL.

At a given moment let us say that we required—

Fuze 18
Up 4 (degrees)

to hit the target.

This data is only of use if the gun is fired at exactly the right moment. If it were applied on the guns, and the guns were fired early, the probability is that the deflection would be too large and we should get bursts ahead of the target. If they were fired late, the bursts would be behind the target. If, however, a wrong

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deflection of, say, 3½ degrees were ordered, then in the first case the bursts would be brought back on to the line of sight, and would appear as effective on the camera record.

In the second case if, say, 4½ degrees were ordered, again we might be giving effective rounds from the camera record. In both cases, however, the fuze would be wrong, so that we could not possibly have hit the target; in fact in the first case we would have been "short" and in the second "over." It is therefore necessary to check whether such a fuze has been selected as will enable the guns to be fired at the right moment, and this is done by a special recorder who watches the instruments from which the fuze is obtained.

3. *Height.*

In anti-aircraft fire, the calculations required to obtain a hit are entirely based on the measurement of the correct height of the target. Height is used instead of range, because range is changing rapidly all the time due to the target's movement, whereas, unless driven to it, a pilot will not change his height frequently, unless engaged on special work involving diving on his target, etc. The A.A. gunner relies on this fact entirely. In fact the assumption that a target will maintain a constant height for a limited period of time, is one of the three assumptions on which the whole of A.A. fire control is based. The other two assumptions are constant course and speed over the same period. A great deal of attention is therefore being paid to the production of satisfactory height finders. But the accurate observation of fire also depends on the existence of an accurate height finder, and it is just as difficult to observe the height of a burst, as it is to observe the height of the target itself. For this reason experiments have been carried out in height observation from the towing aeroplane itself, in the case of full charge shooting at a drogue target. Up to the moment, however, owing to the difficulty of carrying observers in addition to wireless operator and towing gear operator, and also owing to the difficulties of actually seeing the drogue from the aeroplane and co-ordinating these observations with those for line taken from the ground, results have been unsatisfactory in this direction. Attempts have also been made to obtain results by flank observation, but these again have failed because it is not

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possible to get observation posts, at any rate on land, which are at right angles to the line of fire. Furthermore the line of fire moves with the target, through the whole arc of the range, so that although reliable observations may be obtained over a small part of the arc, those over the remainder of the arc of fire are bound to be unreliable. Experiments are to be made this year, with observation of this sort from a tug out at sea, but this system is obviously also fraught with difficulties. Further experiments are in hand to obtain results photographically, but it is too early to say how these will turn out.

Up to the present it has been the custom to make units find the height of the target with their own men and instruments, and if the height ordered tallies with that obtained from check height finders manned by the School of Gunnery staff, the height is adjudged correct for the purpose of allocating effective bursts. The question of height records applies only to the full charge shooting of course. With the reduced or burst short practice charge, the fire is deliberately low, and the only possible way of judging height for effect is that given above. It may, and has been asked, why records of this sort are kept in full charge shooting when after all it is only the hit that counts. This would be true, if only service ammunition were used during practice. Up to the present, however, on the score partly of expense and partly of safety, a special cast iron powder-filled shell which was mentioned early on in this article, has been used instead of the service H.E. The service H.E. shell breaks up into about 150 pieces of approximately 2 ozs. in weight, whereas the practice shell only breaks into from half a dozen to a dozen pieces. The chances of a hit with the latter are therefore only about a tenth of the chances with the former.

This year, for the first time, every unit is firing 100 rounds of H.E. at the drogue target, and it will be interesting to see whether the predictions of various A.A. enthusiasts as regards the hitting power of the modern anti-aircraft battery, are to be fulfilled or not. At the same time it should be pointed out that the object of all kinds of artillery is to direct a volume of accurate fire on to the target. If this is achieved with A.A. guns, their fire will be a powerful deterrent, but the actual hitting of any particular target is, and always will be, largely a matter of good fortune.

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Summing up then. There are two methods of A.A. practice, viz. :—

(1) Full charge practice at a sleeve or drogue target in which the target, for reasons of safety, is limited to a crossing course. At this target, however, attempts are made to obtain direct hits.

(2) Burst short practice in which fire is directed at an aeroplane which flies outside the deliberately limited envelope of the guns. This allows unlimited manœuvre of the target, but fire for hits cannot be carried out.

As regards analysis of fire, this is carried out under three main headings, viz. :—

1. Line,
2. Fuze,
3. Height,

and as far as it is possible within the limits of the means of observation available, no round is given as effective unless it satisfies the three points. It is frequently argued that observations for line and fuze only, are entirely useless as guides to the efficiency of an A.A. unit, but this is not strictly true. The A.A. instrument, known as the predictor, which finds the fuze and travel deflections, is entirely independent of the height finder. It is so designed, that no matter what height is fed into it, if properly worked it will produce bursts on the line of sight : if improperly worked it will not do so. Therefore, even if height considerations were ignored altogether in our analysis, very valuable information as to the efficiency of our predictor and gun detachments would still be obtained, and if this is tabulated each year a very good picture of the general advance in efficiency of both the personnel and equipment will result. These figures appear annually in various reports, as percentages of rounds within the half-degree and one-degree circles, and the improvement in them in the last few years has been remarkable. With one system of fire, some units have obtained in the half-degree circle as many as 80% of the total rounds fired over a given period. The averages, of course, work out lower than this, but during this period the average has been more than doubled in all methods of A.A. fire control.

It is to be hoped that in the future, the improvement in the

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height finding will be as marked as that achieved in the prediction, though up to the present this has proved to be a very difficult problem, and one which is occupying the attention not only of ourselves but of every nation in the world which is interested in the development of anti-aircraft fire control.

In conclusion, it may be of interest to the reader to know that several countries, including America and Spain, have adopted as standard the British anti-aircraft predictor, thus demonstrating once again that even in the newest sciences, British brains and workmanship still lead the world, in spite of the gloomy prognostications of many pessimists who regale us with their views in the public press. One of the principal criticisms levelled against the science of anti-aircraft gunnery, is that the cost of the instruments required is high. It must, however, be remembered, that in the solution of any problem involving mechanism, the more difficult the problem, the more complicated and therefore costly does the mechanism tend to be, at any rate in the earlier stages of development. After all, the anti-aircraft problem is by far the most difficult that the gunner has been called upon to tackle. The question as to whether he has already solved it or not, can only be answered by practice. There is, however, one fact that must not be lost sight of, and that is, that in the normal progress in the design of the necessary mechanisms, the tendency is to remove the chances of the human error of the detachments, and make everything automatic. The effect of this policy is twofold—it tends to make the mechanism more complicated and costly, but this is balanced by a very appreciable reduction in the man-power required to work it. In fact it becomes more a question of maintenance, and a point will be reached, when it will be necessary to consider whether, in a national crisis such as the Great War, it will be easier to obtain a comparatively few highly-trained mechanics or a large number of men less highly trained, who will turn the handles of less complicated and probably less efficient machines.

The present generation is generally considered to belong to the mechanical age—but what of the future generations, brought up from childhood in an atmosphere of machinery of all sorts? The writer is of the opinion that in the future there will be as many highly skilled mechanics available in a future war, as there were those skilled in the horsemastership required in past wars.

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THE FIGHTING AT MONDEMENT,

9th September, 1914.

By Colonel A. Grasset, D.S.O.

With four pen and ink sketches by M. Morel Fatio,
and one map, 1/50,000.

(Translated from the French by Brig.-Genl. W. Evans,
C.M.G., D.S.O.)

MONDEMENT! . . . an episode of the battle of the Marne the narrative of which grips you because of its pathos. On it much has been written and the truth not a little distorted. The real story, glorious and full of lessons, deserved a better fate. My task will be to tell it as it really happened.

The battlefield.

This was in the region of the Saint-Gond marshes. The French were to the south; the Germans to the north. The obstacle was a formidable one. The surface of mud is impassable when flooded by the Petit Morin. But in September 1914, without being dry, it presented solid surfaces, more particularly to the west between Villevenard and Reuves. To the south of the marshes lies a plain with villages, clumps of trees or woods, all providing *points d'appui* where the defenders could hold on and prolong a battle of attrition, as long as they had men and ammunition. The villages are Oyes, Reuves, Broussy le Petit, Le Mesnil Broussy, Broussy le Grand, Bannes.[1]

Dominating the whole of this area from a height of about 150 feet, and forming the position of resistance, a limestone ridge covered with woods where the pine tree is predominant, separates the bed of the Marne from that of the Seine. It comprises on the left, the crest of Poirier, the *massifs* of St. Gond wood and Mondement, separated by the glade of Montgivroux, the *massif*

[1] See Sketch I.

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of the Allemant woods, Mont Août and Fère Champenoise. Behind this position of resistance lies the plain of the Vaure, traversing which the road Broyes, Péas, St. Loup, Linthes, Connantre, provides excellent lateral communication for manœuvre.

On the whole it forms a fine field for a defence, such as a man of Foch's calibre would doubtless use to good purpose; but in detail there existed certain grave drawbacks at the time we were there (September 1914). At that time artillery had not the necessary means to fire over woods, and here it was either masked by woods, or had to come into action in full view in the edges . . . Besides, the defender must hold this position of resistance to the death for it dominates the plain towards the south up to the extreme limit of gun range, and should the enemy succeed in taking it he would be able to cut off the retreat of the troops vacating it. What is more it would give him command of the back areas of the centre of our armies which were then extending from Paris up to Verdun and Switzerland.

The opposing forces.

On our side Foch's (9th) Army had been fighting here since September 5th—first north, then south of the marshes from Soizy to below Fère Champenoise, on a front of 28 kilos. as the crow flies. He was disposed as follows:—The IInd Corps held the plain east of the marshes in the Fère Champenoise area. The IXth Corps (Gen. Dubois) comprising the 52nd Reserve Division, the 17th Division, and the Maroccan Division guarded the southern exits of the marshes from Bannes to Soizy. The 42nd Division (Gen. Grossetti) was attacking in the Soizy area. Confronting the 42nd Division and the marshes were the *VIIth Corps* and *Xth Corps* of *von Bülow's Army*. Before the IInd Corps were *von Bülow's Guard Corps;* and the *XIIth Corps* and *XIIth Reserve Corps* of *von Hausen's Army*. Total—10 German divisions against 6 French.

After three days of desperate fighting the 42nd Division was unable to make progress beyond Soizy and the Maroccan Division was driven back on St. Gond Wood, but on the left the front remained unbroken. On the right on the other hand, the IInd Corps, overwhelmed by triple its numbers and by great artillery

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superiority, had been overwhelmed. It had to abandon Fère Champenoise and used up the rest of its ammunition in a retirement to the south, thereby making it possible for the Prussian Guard to attack Mont Août, Connantre, and to take the high ground at Allemant from the rear.

So the general situation of the IX Army on the evening of September 8th was extremely grave.

The Maroccan Division.

It is only the Maroccan Division with which I propose to deal starting from the evening of September 8th. It consisted of ten battalions, or rather the remains of ten battalions decimated by the previous fighting. Companies averaged less than 50 men and hardly any officers. The divisional artillery comprised:

1 four-gun 75m/m battery of the 8th African groupe.
1 ,, ,, ,, ,, 9th ,, ,,
1 *groupe* (2 four-gun 75's) ,, 4th ,, ,,
2 four-gun 75m/m batteries of the Colonial Maroccan groupe.

Total— 6 batteries divided into two *groupes* of three batteries— the *groupes* Schneider and Martin. There was no heavy artillery but the G.O.C., Corps had reinforced the Maroccan divisional artillery by the two *groupes* Goyot and Geiger, each of two six-gun batteries of the 49th Regiment of Artillery belonging to the corps troops.

The rank and file of this division were excellent soldiers, but of rather an unusual type. Amongst them were Arabs, Kabyles, Maroccans, Riffs, negroes . . . . They all had been under fire in Morocco and had behaved well, but though they were quite steady under rifle fire, the bursting shell terrified them and it took the officers all their time to keep them from bolting when it came to a violent bombardment. General Humbert who commanded the division, had the full confidence of his men who loved him, in spite of his severity, for his ability and courage and for his energy and reckless bravery.

The morning of September 9th.

September 8th had been a day of very hard fighting for the tired troops. All along the front from St. Gond Wood to Allemant

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Wood—a line that had to be held at all costs—the battalions of the two brigades were mixed up together and only could find one man to every ten metres. They were in front of St. Gond Wood, the Montgivroux glade, Mondement Wood and Allemant Wood. Mondement and the Château were only patrolled, as General Humbert, fearing the effect of the big German shell on his riflemen, directed that these points should not be occupied. As reserve to this long, thin, tired line, the General, whose headquarters were at the Château des Pucelles at Broyes, had only his two cavalry squadrons. Up till the day before he had had three battalions of the 77th lent him, but the Corps commander had withdrawn them and they were now at St. Loup waiting to be sent to Fère Champenoise where the situation was critical.

The artillery was disposed as well as possible though the ground was difficult. The two *groupes* Schneider and Martin were on point 185, 2500 metres north-east of Allemant. Though somewhat in the air on the flank of the division and with no infantry escort, they absolutely commanded the two Broussy's and even Coizard and Courjeonnet beyond the marshes, and could prevent any troops from moving from the east to outflank the Allemant spur. The *groupe* Goyot, of the 49th Artillery Regiment of the Corps Artillery, was in action in a glade in Mondement Wood near l'Etang de la Grande Morelle; point 64-81. From there with O.P's in trees they could take on the eastern crest east of Montgivroux Château and also the western and southern exits from Oyes. The *groupe* Geiger of the same regiment, desirous above all to support the infantry, but unable to find a position for the complete *groupe*, was split up. One battery, the 4th, came into action in the road leaving the wood 200 metres south of Mondement Château (point 93-82). The other battery, the 6th, was in the edge of Mondement Wood, a little east of hill 213, at a point 88-86. These two batteries who could see all the ground north of Mondement and could enfilade all the ravines, were perfectly placed to cover the front of the position, and even to support an attack on Oyes or Reuves, but they were not under cover and movement was likely to be spotted by the hostile artillery concealed north of Villevenard.

The night 8—9, which the troops spent in these positions, was

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a ghastly one. It rained in torrents and for the Africans with nothing but dates and biscuit as rations, squatting in wet rifle pits, with their teeth chattering from the downpour, waiting for the dawn was absolute torture.

Foch.

When a personality of the calibre of the IX Corps Commander dominates the battlefield, it is as well to pause a moment and watch him act. Much may be learnt thereby.

On September 8th in the afternoon Foch was at his P.C. at Fleurs, 12 kilos. south-west of Fère Champenoise, when it was announced to him that his right had been crumpled up and Fère Champenoise taken. He then moved his P.C. to Plancy, 9 kilos. south, and then he continued to watch events, as if he was doing a tactical scheme at the Staff College. Chewing his eternal cigar—generally out—he collected reports, asking precise questions of the officers who brought them. Sometimes they were not sufficiently informed, and then he wasted no time. He soon got down to bed rock and cut short the interview, saying: "You don't know. Good. Go and find out." In his capable mind, out of information more and more confused, he formed a clear idea of what was the actual state of affairs, not only in his own army, but in those adjoining him.—On the right the II Corps had gone back 12 kilos and a gap of 36 kilos. existed between the left of the 9th Army and the right of the 4th. In the centre the Maroccan division and 42nd were holding their ground, with difficulty perhaps, but still hanging on under an avalanche of heavy shell and in face of furious and repeated attacks. But to the east the 4th Army was gaining ground. To the west Franchet d'Espérey and French were advancing. Further off Manoury was easily holding his own.—And in the afternoon of the 8th, although the news of the 9th Army was bad, he said to Colonel Weygand, who happened to come in: "The reason why they are pressing this attack so furiously is that things are going badly with them elsewhere." He then produced for G.H.Q. an accurate appreciation of the whole situation. He finished his report with this remarkable phrase which exposed the German plan, and which Napoleon could not have bettered: "So the situation is excellent; the

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attack on the 9th Army appears to be with the object of assuring the retreat of the German right wing." And he announced his willingness to attack.

Now this was the very moment when Klück, struck in the flank by Manoury, hastily recalled the divisions he had imprudently sent to the Grand Morin, and so made the 60 kilo. gap in the German line into which Franchet d'Espérey and French were about to advance. . . . Yes, "things were going badly elsewhere."

But to attack here? What with? There was nothing behind this thin wavering line. Yes there was—the 5th Army had only cavalry in front of them. They could relieve the 42nd Division at Soizy, and the 42nd Division then could move by Broyes, Péas, St. Loup and throw itself on the flank of the enemy engaging the IInd Corps. Franchet d'Espérey promised the help demanded. Early in the morning of September 9th the 51st Division should relieve the 42nd. Orders were given at 22 hours. So you see the commander's head and heart were in the right place. Now let us go back to the Maroccan Division.

The morning of 9th. Loss of Mondement.

During the night, in the rain, General Humbert issued this formal order: "There must be no retreat. You must hold on to the bitter end."

5.30. The dawn began to show in a dirty grey sky and echoed with the thunder of the guns. Our miserable trenches were overwhelmed by an avalanche of heavy shell and demolished. The panic-stricken riflemen sheltered themselves as best they could. Those of our artillery *groupes* that were concealed did their best to reply. The batteries in the north edge of Mondement Wood were silenced and the gunners crouching behind the shields could not fire a shot.

8 hours. The enemy attacked and the German heavy artillery doubled the violence of a fire to which we could make no reply. As I have already said, we did not hold Mondement. Elements of the *164th Hessian Regiment* dribbled in and chased our patrols out. The main body of the regiment (two battalions) occupied Mondement, the church and the farm, and a detachment formed of a section from each of the three battalions, with numerous

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machine guns, under Captain Dettmer, entered the château and organised it as a redoubt. This was completed by 9.30. And now with machine guns, loopholes, fire-steps, mattresses in the windows, and sheltered from our artillery by the crest of Mondement Wood—we had no heavy artillery—the château was ready to defy the attacks of large bodies of infantry. It became merely a question of ammunition holding out. And now they turned machine-gun fire onto our batteries in the edge of the wood already immobilised by hostile artillery fire, and in an instant their losses were terrible.

Just then Colonel Barthal, commanding the 49th Regiment of Artillery, arrived on the scene. He came to see "if anything could be done" and at once saw that they were useless where they were, so he told the 6th Battery to try to withdraw through the wood and look for a position behind the 4th Battery. He had hardly given this order when a 4·2 howitzer shell burst under his horse and killed them both. Our gunners managed to run the guns back into the wood, though they suffered severely in so doing, and there they succeeded in limbering up, and took their guns south of the wood to point 85-72. The 4th Battery, unable to fire a shot owing to shell fire and the machine-gun fire from the château, adopted the same procedure and managed to join the 6th Battery about 10 hours.

General Humbert asks for help.

Mondement, 300 yards from the wood, formed an excellent jumping-off place for a hostile attack. From there the enemy could dribble men up to the crest under cover from our artillery. Now we possessed no reserve capable of resisting a rush. The 49th Regiment of Artillery did its best, but as no view of the château could be obtained from south of the wood, this made it very difficult for them. By dint of very hard work, they succeeded about 11 hours to get two guns into action in the edge of the wood at point 93-74, a thousand metres south of the château, but even here these guns could only fire on the eastern end of Mondement village, and not the château which was hidden from them by a dense wood. General Humbert had anticipated that this critical situation would arise, and at 6 hours, feeling that an attack would take place, and knowing his own weakness he appealed for supports.

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On this General Dubois, the Army Corps Commander, although desperately uneasy about Fère Champenoise gave orders for the three battalions of the 77th Regiment to go back to Broyes.

This was not all, for the 42nd Division, late in being relieved by the 51st, was still in its position and General Grossetti, the divisional commander, who had orders to be at Linthes by midday was still walking up and down the Sezanne road at 8 hours waiting impatiently for his regiments to appear at its junction with the road to Lachy. It was here, and at that time, that Humbert's appeal reached him. "Assistance urgently needed, at all costs . . . " Where then did Grossetti's duty lie? Linthes or Broyes? Linthes, evidently; Foch's order called him there. But on the other hand if Humbert was overwhelmed and the enemy reached Broyes, would the 42nd Division be able to get to St. Loup under the German shell-fire? So, as he understood it, his duty, and his sense of comradeship demanded that Humbert should be helped. If the delay at Linthes should lead to his having a disaster on his conscience for evermore—well, he accepted the responsibility and gave his orders.

The 16th Battalion to halt at Broyes and so prevent the enemy from debouching from Mondement Wood. The 19th Battalion of Chasseurs, which was still near Montgivroux, to block this glade and direct flanking fire on the northern edge of Mondement Wood.

That was all he could do at the moment as the rest of his infantry was not available. But Colonel Boichut, his C.R.A., was with him. He heard the order and said: "And what about the artillery. Why not artillery? We will trot up to the plateau of Broyes. Fire like mad, then slip away and we'll still arrive at Linthes before the infantry." The idea was excellent and General Grossetti agreed at once. "Carry on," said he, and Colonel Boichut, a real thruster, at once gave his orders.

Alvin's *groupe* of 61st to proceed to point 79-92, neat Montgivroux Château; to enfilade the whole of the northern edge of Mondement Wood. Two *groupes* of 46th were already there.

Ménétrier and Aubertin's *groupes* of 61st to be on the hummock 227 south of Mondement Wood. The remaining *groupe* of the 46th to follow the 61st as soon as available. For immediate action at the trot.

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The Colonel possessed a motor car of his own. He jumped in and reached General Humbert who was on the road north of Broyes, near 227, at 9.30 hours. "General I am bringing you the 42nd divisional artillery." "I am afraid you'll be too late for the battle" was Humbert's reply. The colonel went on towards Mondement Wood. Groups of riflemen were falling back with no leaders. "Do we still hold the wood?" he asked an officer. "Theoretically, yes" was the answer.

The situation from 8—11 hours.

A heavy and ceaseless bombardment of our line from St. Gond Wood to Allemant Wood. The infantry about 9 hours were very shaken and uneasy as cartridges were running short. At 9 hours the men in the northern edge of Allemant Wood came under bursts of machine-gun fire from the château and so concluded that the enemy had arrived there. A young sub-lieutenant who commanded the section on the left, thought he ought to tell his battalion commander . . . . his section followed him, and this movement spread from left to right, the other sections thinking that a retirement had been ordered. There was no panic, however, and when Major Lagrue ran up the brave fellows went back quietly to their positions. A soldier said to General Blondhat who also rallied a group, "Oh general, if you only knew how tired we are."

That really summed up the situation. The men had reached the limit of their endurance. After fifteen days of privation and the unaccustomed strain of the retreat they had now been fighting a desperate battle without rest, sleep or enough to eat for four days . . . . It was only their *moral* that kept them going.

The arrival of the 77th.

The 77th, who had been fighting for four days mixed up with the Maroccan Division, had been withdrawn from the firing line on the morning of the 8th. They had spent the night 8—9 in the rain, near St. Loup. After fasting for four days the companies at last had received something to eat. The captains had bought some sheep—the cooks were cutting them up, and coffee was being heated on the fire; rumour had it that the enemy was retiring . . . This all kept the *moral* of this regiment very high. And so prepara-

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tions for a meal were being made when at 8 hours 45 Colonel Lestoquoi, commanding the Regiment, received orders to place himself at once at General Humbert's disposal. One battalion to proceed to Allemant as quickly as possible to counter-attack the enemy moving on Mondement. The two other battalions to go to Broyes, and thence proceed to reoccupy the northern edge of Mondement Wood. Cooking pots were packed up and the meat put raw into the mess tins. Colonel Lestoquoi himself led the Merlis and Courson battalions across country towards Broyes; Colonel Eon, the brigadier, accompanied the Beaufort battalion towards Allemant.

At 11 hours the Beaufort battalion was in the northern edge of Allemant Wood amongst the zouaves of the battalion Lagrue. At 12 hours 30 the battalions Merlis and Courson were in the northern edge of Mondement Wood amongst groups of tirailleurs. After a reconnaissance of the ground, Colonel Lestoquoi thought that the château could be quite easily taken. All he wanted was a single gun to be brought up the ride that runs from west to east through the wood, and looks straight at the gateway. But the gunners of Goyot's *groupe* from whom he had demanded the gun, thought it was useless risking a gun under the fire of the machine guns perched up in the towers of the château.

The first attack on the château.

Thus denied any artillery support, Colonel Lestoquoi decided to wait. The Beaufort battalion commander had at that time arrived at the northern edge of Allemant Wood with orders to attack the enemy marching from Reuves on Mondement. Colonel Eon, when he had left him in the southern edge of the wood, had again repeated this order. So it was clear he should attack. True, the enemy was no longer marching from Reuves on Mondement, but in the château, though perhaps not yet firmly established there. No doubt the moment was favourable for an attack on it. He was neither in touch with Colonel Lestoquoi in the Mondement Wood, nor with the artillery . . . . No matter, he must make the attempt. Henrion's company (6th) would attack by itself, the other three companies deployed along the edge to support him with fire. Henrion started—machine guns at once opened—captain

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severely wounded and the company decimated. What was left fled back into the wood. This rough encounter only lasted five minutes.

The commandant decided not to renew the experiment but to get on to the Broyes road which runs through the wood and to make use of this sheltered approach to get within assaulting distance of the chateau. At 12 hours 30 the battalion reached the Broyes road. General Humbert was there on horseback: "A great victory on the left" said he to the battalion commander, "everyone must advance. The artillery will support you." Ten minutes later the battalion was assembled behind the edge of the wood near the road and facing the château. A captain of artillery came up and informed him that three *groupes* would support him; the artillery preparation on the château would start at 14 hours 20 and last ten minutes . . . . so the attack would take place at 14 hours 30. Watches were synchronized and they waited.

The artillery support.

What artillery support would the troops about to attack Mondement get? The artillery consisted of three groupings:

North-east of Allemant were the *groupes* Martin and Schneider of the Maroccan divisional artillery. They could not see Mondement and were firing on Oyes, Reuves, and Broussy.

Immediately south of Mondement Wood were the *groupes* Goyot and Geiger, of the 49th Regiment (Corps Artillery). They were firing on Reuves. They were told to fire on Mondement. But they could not see Mondement on account of the thick wood more than a kilometre wide which lay between them; and they had not enough telephone wire to establish a F.O.O. in the northern edge. All they could do was to fire a more or less inaccurate area shoot. Only two guns, those of Capt. Bony de Lavergne in the edge of Allemant Wood could fire on the eastern portion of the village and on the terrace of the château.

Of the 61st Regiment, the *groupe* Alvin from near Montgivroux château could see the northern part of Mondement village but not the château. The *groupes* Aubertin and Ménétrier who had reached the hummock 227 could neither see Mondement nor the château which were hidden from them by the woods. How-

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ever, Major Aubertin, an excellent gunner, had belonged to the Geographical Service and had carried out survey work in Africa, so he determined to try and solve the problem with the very insufficient means at his disposal. He worked out the line on a 1/80,000 map for his right gun and gave parallel lines to the remainder. He sent a subaltern up to the edge of the wood to observe a trial shoot. The latter, Lieut. Gobron, returned very pleased. Some of the shell had burst in the wood caught by the high trees, but on the whole they all burst within a zone of 100 yards . . . . unfortunately the whole depth of the château was less than this. Never mind, they awaited zero hour with confidence.

The second attack on the château.

At 14 hours fifty shells came whistling over the heads of the front line and burst in front. The enemy made no reply. A rumour emanating from the staff had it they were retiring—had probably gone. The road, which is sheltered, formed the best line of approach right up to the château wall. So the Beaufort battalion adopted the following attack formation: Column, eight abreast on the road. The company Génois (5th) leading; then Villers (8th); then Montesquieu (7th), 400 mètres distance between companies. Henrion (6th), badly cut up earlier in the day, to remain in the edge of the wood and form a battalion rallying point in case of need.

Immaculate as usual and wearing white gloves, Major de Beaufort was looking at his watch. At 14 hours 30 he waved his hand and called "Forward the 5th—*Pour la France!*" A trumpet sounded the charge.

Lieut. Génois was the first out of the wood. He had his revolver in his left hand and an old twisted bayonet in the right. The men, reservists just up from the depot, followed him in perfect order. A hundred mètres from the edge the company began to double and reached the park wall of the château in one bound. This wall was intact save for some breaches which hardly affected its value as an obstacle at all.[1] While the sections were getting sorted out and regaining their breath, Villers (8th) company started

[1] See Sketch III.

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in its turn, but this time under fire as the enemy was now alert and bullets fell thick. Montesquieu's (7th) company then followed up the 8th at once and a company of zouaves who had followed the battalion also joined the assault. This mass mixed with the 5th company all along the wall. There the men had cover but directly anyone tried to go into the park there was a hail of machine-gun bullets. Major de Beaufort was killed by a bullet through the head moving towards one of the breaches and Capt. de Montesquieu was killed near him.

Colonel Lestoquoi, in Mondement Wood, had heard the charge sounded. He sent forward Merlis' battalion and a company of *tirailleurs*. This attack was at once stopped by an avalanche of shell and cross fire from the château and a large farm which lies to the west. All the Beaufort battalion extending along the château wall was practically annihilated. A few men raised on their comrades' shoulders, fired over the wall. The few surviving officers conferred together. They decided to retire. On the command "Everyone back to the wood!" they ran back under fire from the château and farm. The affair, with all its exciting incidents, hardly lasted three-quarters of an hour.

The taking of the château.

From 15 hours onwards there was a lull in the battle all along the front of the Maroccan Division though a violent bombardment continued. Our guns replied as best they could by firing what ammunition remained at Reuves, Oyes and the practicable crossings of St. Gond marshes. But the German infantry did not attack, in fact seemed definitely to be retiring. They had been supposed to since 10 a.m., but now indications that this really was the case increased and movements towards the north could be clearly seen. Our men, *tirailleurs*, zouaves, or infantrymen, were prostrated by fatigue. Many were fast asleep in their shell holes, careless of the death that awaited them. Nearly all seemed incapable of further effort . . . Nevertheless, General Humbert's order was quite definite: the Beaufort battalion will again attack the château this evening. Colonel Eon will send this battalion up; arrange his artillery support. Colonel Lestoquoi will also attack by Mondement Wood.

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Colonel Eon, who had studied his ground, said that any artillery preparation by batteries in action south of the wood was quite useless against the ground at Mondement. He asked that one battery only should be allotted him, but that it should accompany the infantry right up to the northern edge of the wood . . . . He was given Naud's battery of the 49th. The battalion was reassembled in the glade which it had left. It was worn out, decimated, almost without officers, but still was of good heart. A few instructions to the officers and everyone was ready. Captain Naud, who had been up to the edge of the wood and could not find room for a battery, came back and said a section would do. The following dispositions were made :

Advance guard—7th company, the directing section under Lt. Ythurbide. 100 mètres behind this company, two guns between two companies each in column of four on either side of the road. The remaining company in support. Lieut. Ythurbide to raise his *képi* to indicate where the guns were to unlimber and be manhandled into position. The advance guard to push up to the edge of the wood and await the result of the gun fire. A signal to be given for the assault. A cyclist was sent to Colonel Lestoquoi asking him to support the attack.

At 17 hours 30 all was ready. The two guns had been pulled by the gunners and infantry into action on the road, 200 mètres from the château. The enemy, who must have seen them, did not open fire. Capt. Naud opened fire with high explosive from both guns on the château wall which broke off in large slabs. The 7th company was about to assault when explosions were heard from inside the wood to the west. This was Colonel Lestoquoi who also had succeeded in finding a gun, running it up through the central ride up to within 400 mètres of the gateway and was now firing H.E. All at once the outhouses of the château, full of fodder, burst into flames. The Beaufort battalion had to wait till this gun ceased firing, and so lost the honour of being first in, for while the gun was firing Colonel Lestoquoi had sent three companies of de Courson's battalion towards the château and four companies of the Merlis battalion to the village, he himself proceeding towards the gateway with his last company.

They expected a desperate resistance. There was none. The

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enemy had gone. Colonels Eon and Lestoquoi met at the gate and entered the main entrance together. All they found in the château were a few dead and wounded of the *164th Regiment.*

The German retreat.

The enemy had as a fact left well before our men reached the château, and the tales or pictures of desperate bayonet fighting round the battlements are pure invention. Under orders from the *2nd Army* the *Xth Corps* commander had given the order to retreat at 14 hours. The order was sent out by the two divisions at 15 hours 30. And Captain Dettmer tells us that Lieut. Lefèvre left the château with his wounded at 19 hours (i.e. 18 hours French time) consequently almost at the moment the assault was made. And so the enemy left, at his own sweet will . . . . So be it!

Let us remember that at 14 hours 30, at the moment when he decided to retire, the situation of the 9th French Army was critical. The Maroccan Division, worn out, had lost Mondement and was on the verge of being turned by Fère Champenoise. The II Corps was only putting up a feeble rearguard resistance and its ammunition was finished. The 42nd Division ordered to counter-attack near Linthes could not have reached that locality before 18 hours and was itself utterly exhausted. Let us remember too that at Nanteuil le Haudouin, Manoury's flank had been turned and he was on the verge of being overwhelmed. And this was the moment the enemy chose to retreat! One can easily understand why it has been described as a miracle!

The Marne and Austerlitz.

When one reflects that von Kluck's withdrawal from the region of the Grand Morin left the field open to Franchet d'Espérey and French who pushed forward, this all becomes perfectly clear. Actually on September 9th at 16 hours the whole of the 19th Division, a brigade of the 2nd and the whole of the artillery of the Ist Corps of Franchet d'Espérey's army, facing east, were already attacking Champaubert, 10 kilos. north of Mondement, right behind Bülow's right flank. . . . From that moment Bülow the victor could do nothing but retire!

I believe there is only one instance in history of a situation

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like this, and that was at Austerlitz. There in the course of a defensive battle a strategem of Napoleon's led the enemy to weaken his right centre on the plateau of Pratzen, and Soult broke through. Here von Kluck's imprudence uncovered the right centre of the German line and Franchet d'Espérey and French moved into the gap. Such is the impression the battle conveys to strategists, but the real lesson does not lie there. It is that if Foch's whole army, and the Maroccan Division in particular had not put up such a resistance as could hardly be expected from human beings on September 8th and 9th, the battle would have been lost in spite of all. This goes to prove that in war victory is to the more tenacious—to those who by sheer force of will succeed in holding out a quarter of an hour longer than their opponents.

But I was nearly forgetting that these pages have been written for my comrades of the British Army, whose tenacity is proverbial and amongst whom Wellington, the Iron Duke who held on so magnificently at Waterloo, counts numerous and glorious pupils. And now in conclusion I shall content myself by reminding you of this mathematical formula of Foch—Marshal of France and Field-Marshal of England—a formula which seems to me to attribute the art of winning more to character and energy than to science: *"Victoire égale Volonté." "Victory is Will."*

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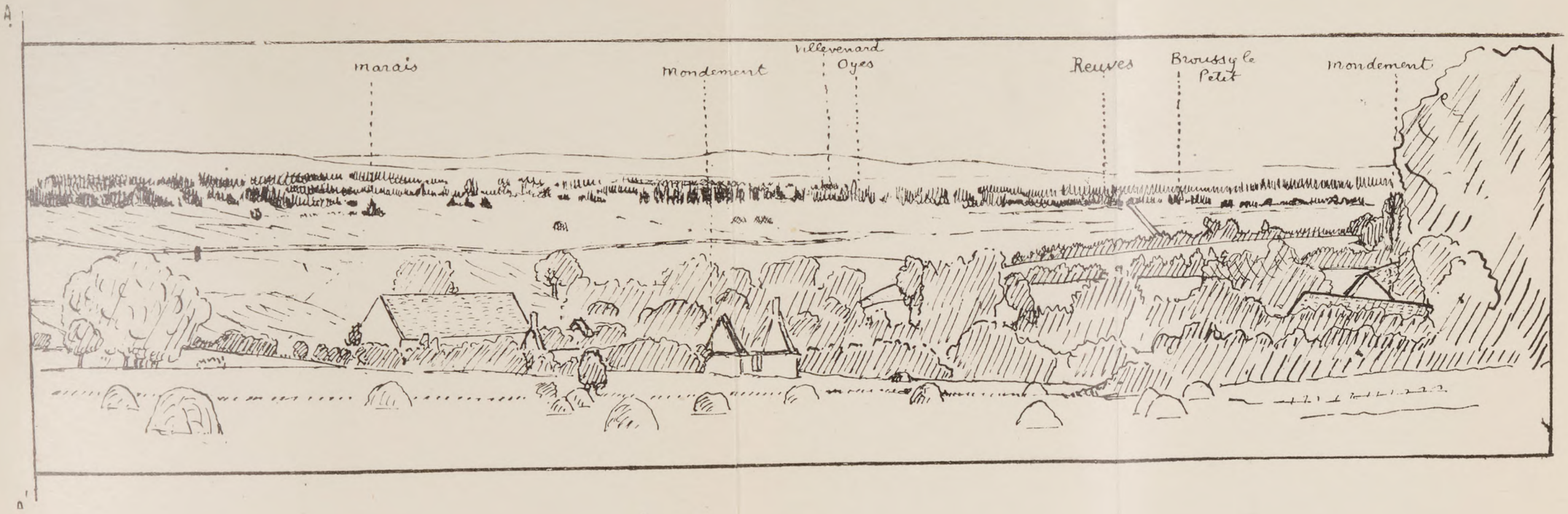
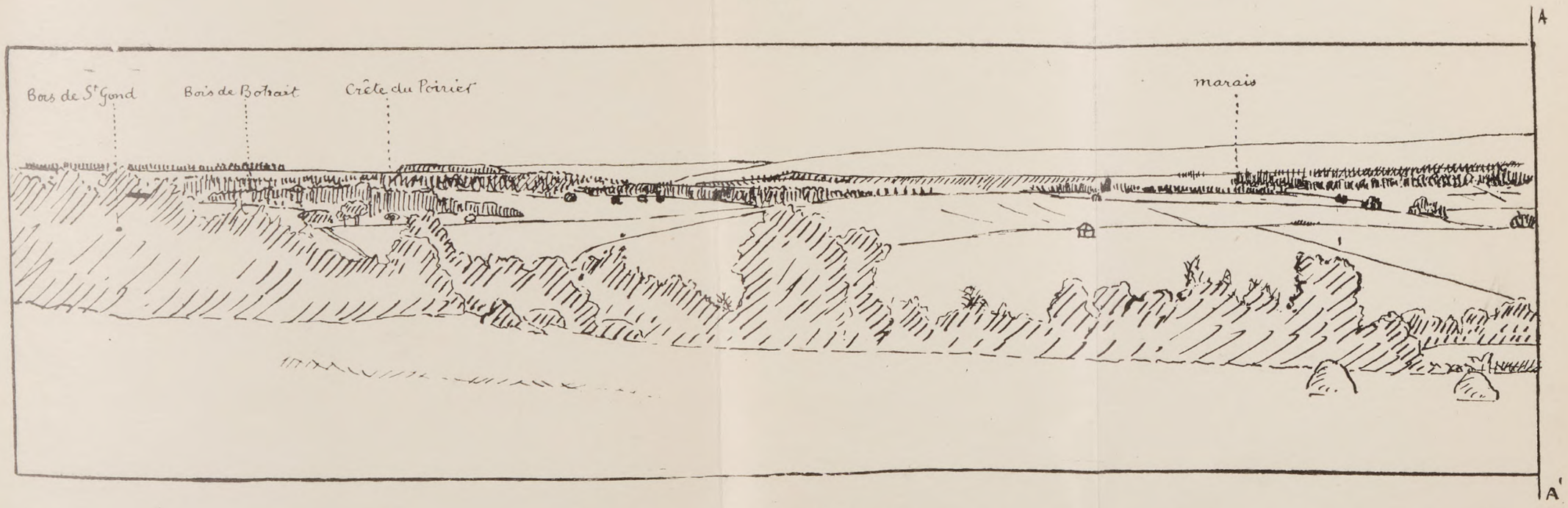
SKETCH I.

EAST.



WEST.



ST. GOND MARSHES.

From point 87.87 (hill 213 in the N. edge of Mondement Wood.) Marked "A" on the map.

SKETCH II.

THE SPUR COMMANDING THE PLAIN TOWARDS THE SOUTH.

From point 03.49 (S.W. of Allemant.) Marked "B" on the map.

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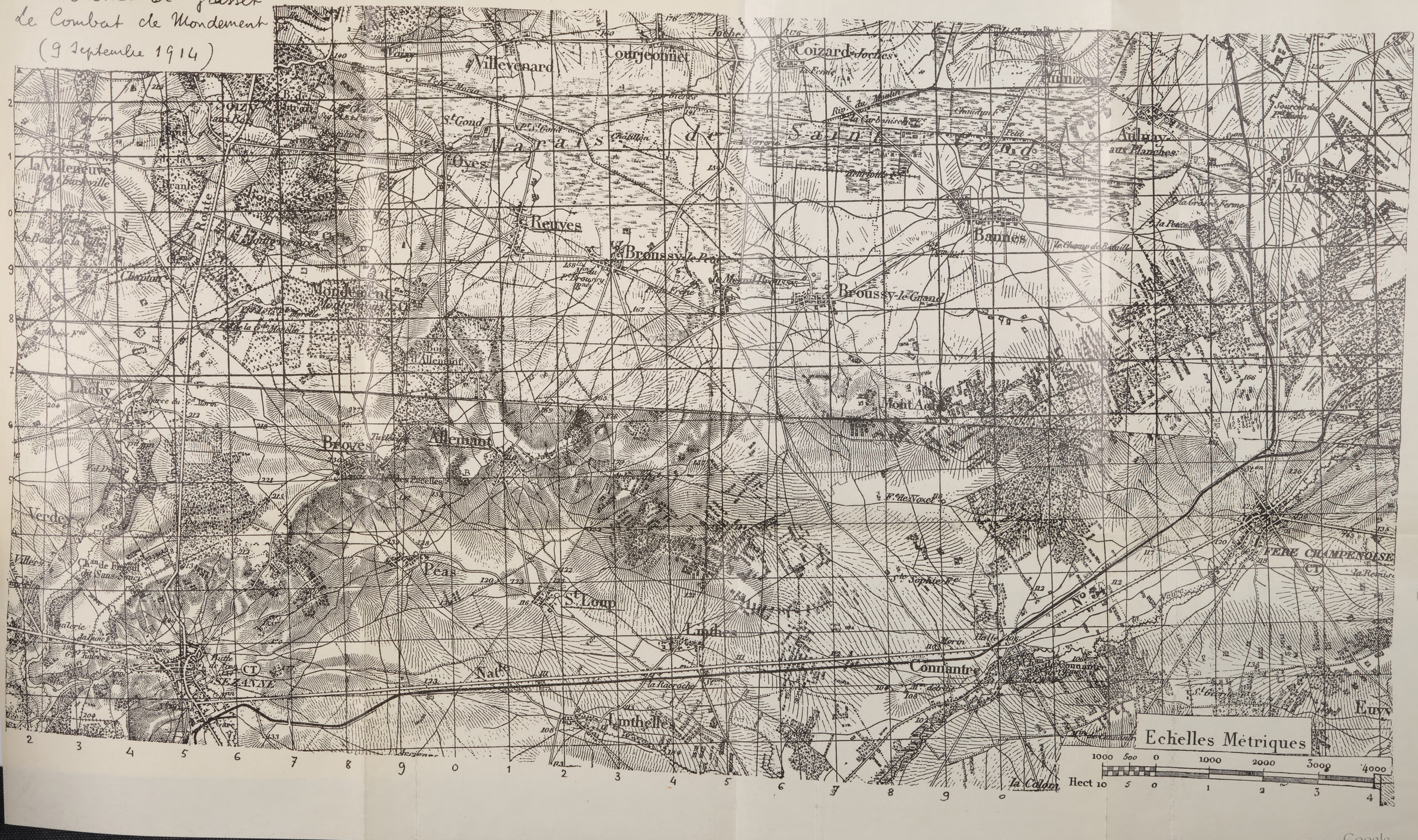
[To face page 310.

Colonel A Grasset
Le Combat de Mondement
(9 Septembre 1914)



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AUTO-FRETTAGE.

BY MAJOR A. E. MACRAE, O.B.E., *pac.*, R.A.,
M.I.MECH.E., ASSOC.INST.C.E.

WE are all familiar with the construction of a Service gun, in which the requisite radial strength is obtained by (a) winding wire on an inner tube or tubes, (b) shrinking tubes together, or (c) by a combination of (a) and (b) :—that is, by methods of "hooping." By these means the radial resistance of the steel wall of the gun is made elastic for the stresses set up by the gas pressure on the bore when the gun is fired. The gun will not be permanently deformed provided the pressure on the bore of any particular section on firing does not exceed that for which it was designed. The latest development in the manufacture of modern guns is known as the AUTO-FRETTAGE, or "Self-Hooping", process of construction. We have manufactured several natures of B.L. and Q.F. guns by auto-frettage, and the results of proof, wear, and expansion trials have proved, beyond doubt, that the process is both sound and practicable. Designers and manufacturers in Japan, America, and several continental countries have been experimenting with this method of construction, and have also made several natures of guns and howitzers by this process. There is no mystery about auto-frettage. The principles are, more or less, commonplace, but their application requires explanation. For the benefit of regimental officers it is proposed to describe these principles and show, in as simple language as possible, how they are used in the process of auto-frettage construction.

It will be necessary, first of all, to define and explain some of the mechanical properties of gun steels, secondly to describe, generally, the order of pressures and stresses set up in the steel wall when a gun is fired, thirdly to show how "hooping" enables the steel of the wall to offer an increased radial elastic resistance to the stresses set up on firing, fourthly to explain how "self-hooping" is produced by the application and removal of a liquid (radial) pressure on the bore of a monobloc (one-piece) tube, and

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finally to describe the actual manufacture of a gun by the auto-frettage process of construction.

1. *Mechanical properties of gun steels.*

Steel used in armament engineering is governed by what is known as a "Specification", which, in addition to limiting the steel manufacturer as regards certain manufacturing details such as chemical composition, forging, etc., requires that the steel shall be homogeneous, that is of sound uniform qualities throughout, and that these qualities are such as to ensure that the steel is suitable for use. The service specification for gun steel gives detailed particulars of the position and dimensions of test-pieces to be cut from discs parted off the ends of a forging after it has been oil-hardened and tempered. These test-pieces are pulled in a testing machine, and acceptance of the forging is governed by the results of these tests; the test-piece results not falling below the tabulated values in the specification. The important mechanical properties determined from these tests show that the steel of the test-piece has a tensile elastic limit of, at least, a certain value, and measures the "stress at maximum load", commonly but erroneously called the "break", "percentage elongation after fracture" and the "percentage reduction of area". The "impact" quality, or comparative resistance of the steel to shock is measured in a special machine known as the Izod Impact Testing Machine. It is, of course, impossible to test the whole of the forging, so the mechanical properties determined from test pieces are considered to exist in all the steel of the forging. This may not be the case, and failures have occurred which have been traced to the poor mechanical properties of a portion of the forging. The conditions of manufacture governed by the "Specification", and the inspection exercised during manufacture tend to ensure that the steel is of sound quality throughout.

Modern testing machines are fitted with an apparatus known as an Extensometer, which will trace a diagram showing the relationship of the movement of the test-piece to the applied load. The simplest form of load-extension diagram is given in the following Figure 1.

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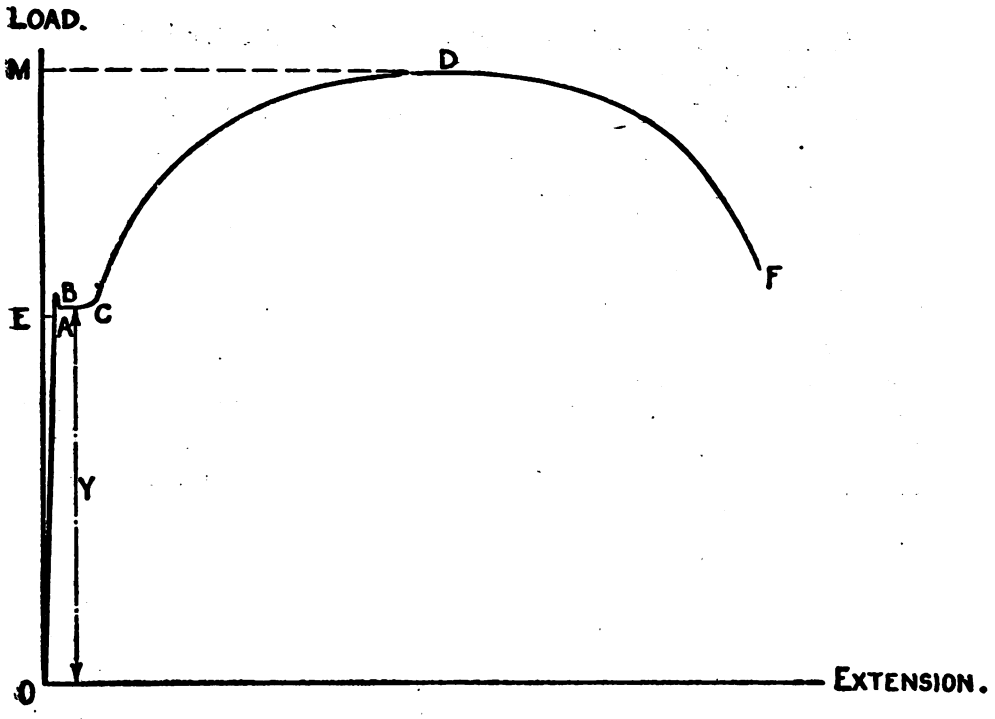

Figure 1

In this diagram the applied loads are recorded as ordinates and the extensions of the test-piece as abscissae. The points to note on this diagram are as follows:—

(a) 'OA' is a straight line indicating a proportional relationship of load and extension, and defines the tensile elasticity of the steel.

(b) At 'A' the curve commences to break away from the straight line of proportionality. 'A' is called the tensile elastic limit, or limit of proportionality of the material, and corresponds to a load 'OE'. Provided the load does not exceed the value of 'OE' the steel will return to its original dimensions; that is from 'A' to 'O' on the diagram, on removal of the load.

(c) At a load equal to 'Y' the steel yields suddenly. There is a comparatively large increase of extension without increase of load.

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(d) From 'C' to 'D' the steel withstands a greater load as the extension increases.

(e) The load 'M' is a maximum at 'D', after which the steel behaves as a plastic material extending very rapidly to final fracture at 'F'.

This type of load-extension diagram is most useful as a record of the mechanical properties, or physical constants as they are sometimes called, of the steel tested, but more valuable and *accurate* information is to be obtained from a load-extension diagram, on a larger scale, of the portion OABC of the curve shown in Figure 1. For several years the author has used the "Dalby" optical recorders and testing machines to obtain these curves for different classes of steels. Two types of curves obtained with gun steel are given in Figures 2 and 3.

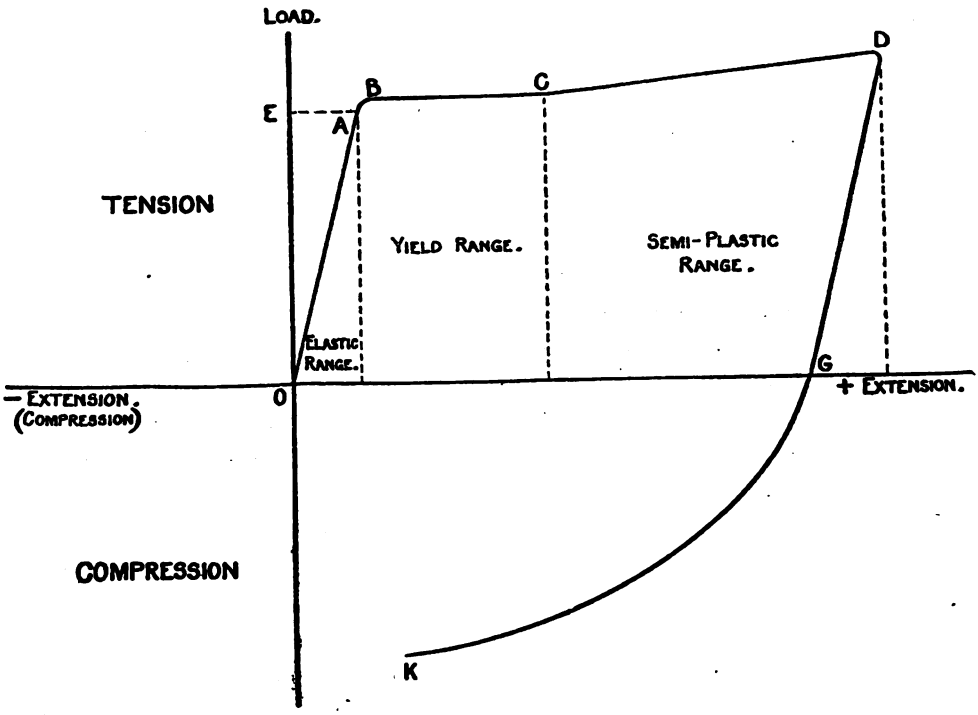

Figure 2.

The curve in Figure 2 was obtained by (1) pulling the test-piece, that is subjecting it to tensile loads, (2) releasing the tensile

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load, and finally (3) compressing the test-piece. The points to notice on this curve are as follows:—

(a) At 'A', the end of the straight line OA, the tensile elastic limit is reached, and this point corresponds to a tensile load represented by 'OE'. For tensile loads not exceeding the value of 'OE' the steel behaves elastically, that is it will return to its original dimensions when such loads are removed. Loads exceeding the value of 'OE' will set up positive permanent deformations in the steel.

(b) From 'B' to 'C' the extension increases at, practically, constant load, and represents the "yield" of the steel.

(c) From 'C' to 'D' the steel begins to withstand a greater load as the extension increases.

(d) At 'D' the tensile load was removed and the steel behaved more or less elastically; 'DG' is parallel to 'AO' for the greater portion of its length.

(e) 'OG' represents the positive permanent extension set up in the test-piece on release of the tensile load.

(f) **'GK' represents the behaviour of the steel when subjected to compressive loads after it has been given a positive permanent set by a tensile load.**

The curve in Figure 3 represents the behaviour of the steel when (1) subjected to compressive loads, and (2) on release of the compressive load. The points to note on this curve are:—

(a) At 'A^1' the end of the straight line 'OA^1' the compressive elastic limit is reached, and this point corresponds to a compressive load represented by 'OE^1'. Also, for compressive loads not exceeding the value of 'OE^1' the steel behaves elastically.

(b) From 'B^1' to 'C^1' the negative extension increases at practically, constant load, and represents the compressive "yield" of the steel.

(c) At 'C^1' the compressive load was removed, when the steel behaved, more or less, elastically.

The important characteristics to be noted from the diagrams of figures 2 and 3 are as follows:—

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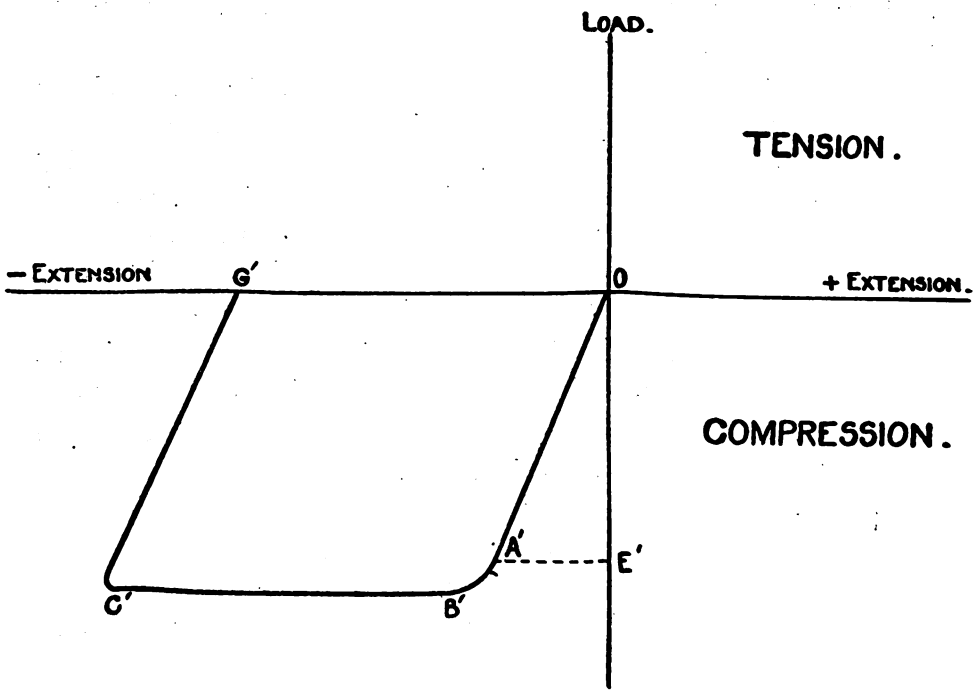

Figure 3.

A. Tensile and compressive elastic limits of the same class of steel have, practically, the same value.

B. Tensile and compressive yields of the same class of steel have also, for all practical purposes, the same value.

C. The behaviour of steel when subjected to tensile loads which set up positive permanent deformations is similar to its behaviour when subjected to compressive loads which set up negative permanent deformations.

D. Deformations under load may be elastic, or elastic and permanent. The deformation at A or A^1 is elastic, that is, it disappears on the release of the load. The deformations at 'D' in Figure 2,or at C^1 in Figure 3 are elastic and permanent, in that on release of the load the elastic deformation disappears leaving permanent deformation represented by +'OG' or -'OG^1' respectively.

E. A steel which has been given a positive permanent

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deformation has, practically, no compressive elasticity, and its behaviour when subjected to compressive loads (curve 'GK', Figure 2) is said to be "plastic."

F. 'OA' has been called the "ELASTIC" Range.
'BC' is known as the "YIELD" Range.
'CD' has been defined as the SEMI-PLASTIC Range of the steel.

2. *Pressures and stresses set up in the steel wall when a gun is fired.*

In Figure 4 let D_0 and D_1 represent the bore and exterior diameters of a monobloc (one-piece) gun at any particular section in its length.

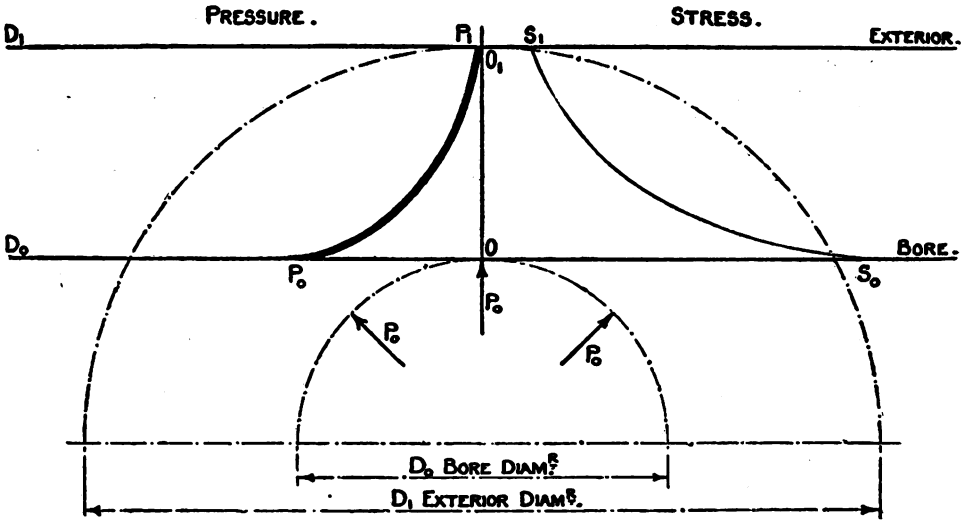

Figure 4.

Let the gas pressure set up on firing be represented by a radial bore pressure P_0 tons per sq. inch at this section.

It has been established that the radial pressures throughout the wall of the gun may be represented, accurately, by the curve P_0P_1, and the stresses set up in the steel of the wall by the curve S_0S_1. In the above Figure 4, therefore, O P_0 represents the value of the pressure on the bore in tons per sq. inch, and when P_0 is acting, OS_0 tons per sq. inch is the value of the stress

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set up in the steel of the bore, and O_1S_1 tons per sq. inch the value of the stress set up in the steel of the exterior of the section.

For a particular class of steel of uniform tensile elasticity the bore of the gun at this section will not be given a positive deformation by repeated applications of pressures equal to P_0, if S_0 does not exceed the tensile elastic limit of the steel.

When S_0 equals the tensile elastic limit, the gun is said to be stressed its maximum radial elastic resistance by the bore pressure P_0. All the steel in the wall will be stressed in the elastic range of the steel when bore pressures of any value up to and including P_0 are applied. On release of such pressures the gun will return to its original dimensions.

3. *"Building up" to increase the Radial Elastic Resistance of a gun.*

If it is desired to construct a gun of the same bore and exterior dimensions D_0 and D_1 respectively, so that a greater pressure than P_0 can be used without setting up positive permanent deformations, it will be necessary to :—

1. Use a steel of higher tensile elastic limit, so that S_0 can be greater with a corresponding increase in P_0, or,
2. "Build up" the gun so as to produce initial negative tensions (compressions) in a portion of the wall near the bore of the gun, so that when the pressure is applied a RANGE of elasticities (compressions + tensions) is available in that portion of the wall where the set up stresses are highest.

   Initial compressions may be obtained by building in one of three ways.

   (a) Compressing an inner tube by winding wire on the exterior.
   (b) By shrinking on an inner tube one or more outer tubes.
   (c) By a combination of (a) and (b).

In these methods of "built up" construction initial compressions obtained may be shown as follows :—

2 (a) Wire-winding on an inner tube.

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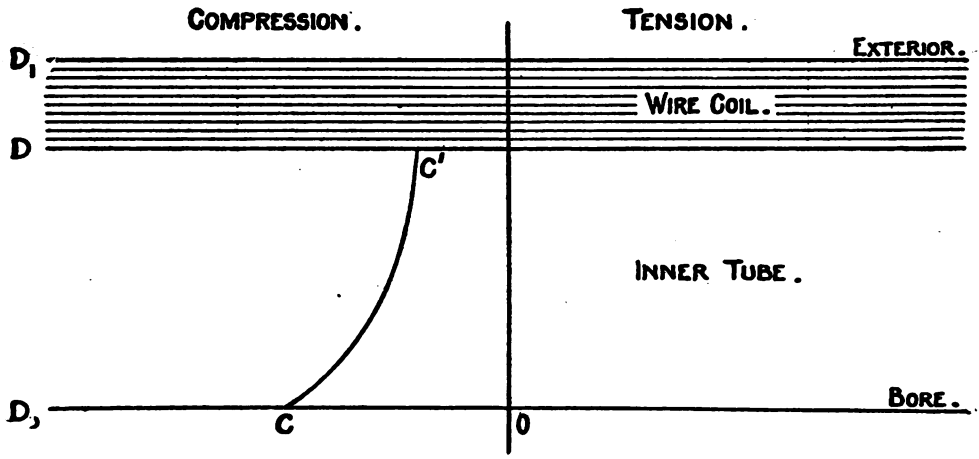

Figure 5.

Let D_0 and D represent the bore and exterior diameters of an inner tube, wire wound as shown in Figure 5 to an exterior diameter D_1. The initial compressions set up in the inner tube are represented by the curve CC^1.

2 (b) Shrinking one tube on another.

Here again D_0 and D represent the bore and exterior diameters of the inner tube, D_1 the exterior diameter of the outer tube, CC^1 the initial compressions in the inner tube, and TT^1 the tensions in the outer tube.

2 (c) It will be seen from the diagrams in Figures 5 and 6 that a combination of these two methods could be used to obtain initial compressions in the inner tube.

In Figure 4 the value of P_0 reaches a limit when S_0 equals the tensile elastic limit of the steel. By "building" it is possible to set up initial compressions or negative tensions represented by the curve CC^1 in Figures 5 and 6. In a "built up" gun, therefore, there is a range of elasticity available to offer an elastic resistance to the stresses set up by the bore pressure, and this range is greater than that offered by the tensile elasticity of the steel alone. The value of P_0 may therefore be increased under these conditions, and when this increased value of P_0 is applied, the steel at the bore will not be stressed beyond the tensile elastic limit of the steel.

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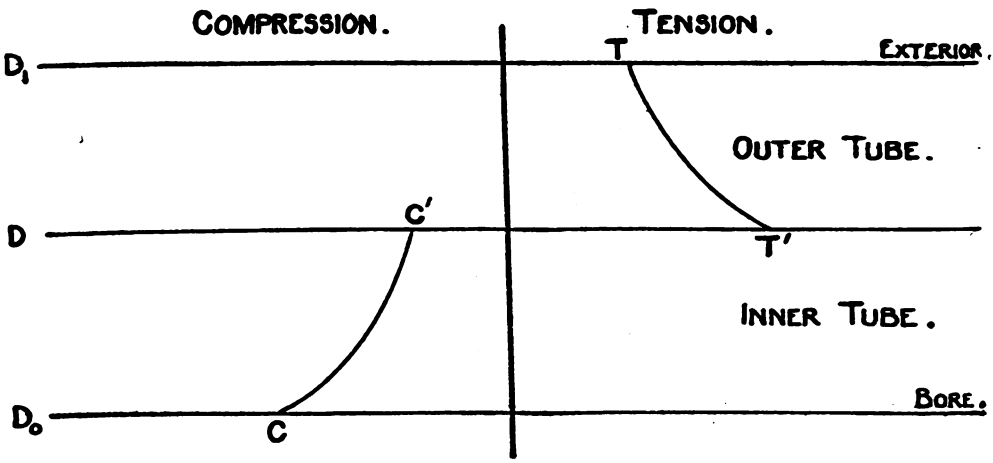

Figure 6.

4. *Auto-Frettage or "Self-Hooping".*

The diagram in Figure 6 shows that it is possible to shrink tubes together in such a way, that in a gun each tube will do a share of the work of resisting the stresses set up by the pressure on the bore. The ideal would be reached if each tube were used to its tensile elastic limit, so that each member of a gun body would be worked to its maximum without fear of permanent expansion. Under these circumstances the greater the number of tubes which make up the wall of a gun the greater would be the radial strength. For an equal thickness, therefore, a gun made up of an indefinite number of infinitely thin tubes will be the gun of maximum radial resistance.

Let us consider the wall of the section of the gun, represented by the diagram in Figure 4, to consist of an infinite number of infinitely thin tubes, so that the wall represented by D_0 and D_1 may be considered to be made up of numerous layers of steel.

If the value of P_0 is increased so that the value of S_0 exceeds the tensile elastic limit of the steel, the bore layer will be given a positive permanent deformation, or permanent set, and all other layers will be stressed in the elastic range of the steel. A small additional increase in P_0 will set up permanent set in the layer next to the bore layer, increase the permanent set in the bore layer, and set up greater elastic stresses in the outer layers.

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As the value of P_0 increases still further, layers more remote from the bore will be given a permanent set, and the permanent set of innermost layers further increased; the permanent set produced being a maximum in the bore layer, and graduated to the layer just given a permanent set. The number of layers subjected to elastic stresses will become less and the elastic stresses in these layers will be increased accordingly.

Each layer of steel from the bore to the exterior, on being subjected to tensile stresses set up by the bore pressures, will behave in accordance with the tension curve of the load-extension diagram shown in Figure 2, that is, as the value of P_0 increases continuously from zero, the bore layer will be stressed through the elastic, yield, and semi-plastic ranges of the steel. The layer next to the bore layer will in its turn be stressed through these ranges, but permanent deformations will be less than those set up in the bore layer. Layers in sequence more remote from the bore layer will be stressed in some or all of these ranges and be given graduating permanent sets, until a layer is reached which is only stressed to the tensile elastic limit of the steel.

It will be seen, therefore, that for one particular pressure the layers throughout the wall will be stressed in the ranges of the steel shown on the tension curve in Figure 2, and when a particular

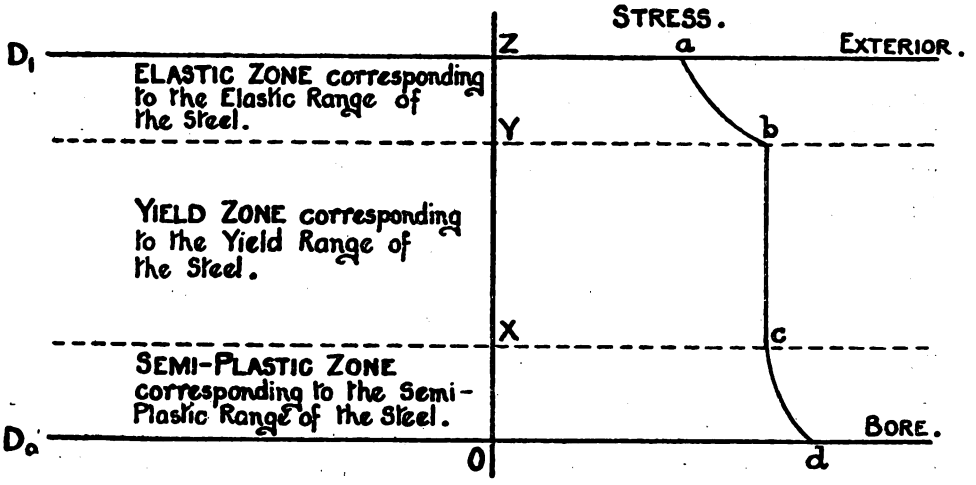

Figure 7.

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bore pressure is acting, the wall thickness may be considered to be divided into three zones corresponding to these ranges. The diagram in Figure 7 will make this clear.

The steel in the elastic zone is stressed in the elastic range of the steel, and the stress, represented by the curve 'ab' which corresponds to OA in Figure 2, increases from a value Za at the exterior to Yb at a diameter where Yb represents the original tensile elastic limit of the steel. In the yield zone the steel is stressed in the yield range of the steel, and as in this range the load was found to be constant (BC in Figure 2) Yb=Xc. The semi-plastic zone includes the bore, and 'cd', which corresponds to CD in Figure 2, represents the stress set up in this zone, where Od is greater than Xc. When the bore pressure, which sets up these states of stress, is acting, the positive deformations set up in the layers of the elastic zone are elastic, and those set up in the yield and semi-plastic zone are elastic and permanent. The permanent deformations are a maximum at the bore and are graduated through the wall to zero at the diameter at which the stress Yb equals the tensile elastic limit of the steel.

On release of the bore pressure, layers which were in states of elastic stress endeavour to return, elastically, to their original dimensions. Those layers in which the deformations were elastic and permanent are relieved, or tend to be relieved, of their elastic stresses, but owing to the positive permanent deformations set up by the bore pressure are unable to return to their original dimensions. Those layers which were permanently deformed on application of the bore pressure have lost their compressive elasticity and will behave as a plastic material to compressive stresses (curve GK Figure 2). Outer layers in endeavouring to return to original dimensions exert compressive stresses on these plastic layers and set up compressive deformations in these layers. The plastic layers, however, offer some resistance, which results in the outer layers remaining in states of residual tension. The positive permanent deformation set up in the bore layer on application of the bore pressure is greater than that set up in the second layer. By reason of this difference the bore layer offers a resistance to closing in of the second layer. In these two bore layers, therefore, the effects of shrinking one layer on the other are obtained; relatively

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the inner layer is in a state of compression and the outer layer in a state of tension (CC^1 and TT^1 of Figure 6). The third layer from the bore tends to set up additional compression in the two inner layers, and remain in a state of residual tension; the effects of shrinking an outer layer on two shrunk up layers. Hence, throughout the layers which were permanently deformed on application of the bore pressure the effects of "continuous shrinkage" are obtained.

In addition, in the layers which were stressed elastically by the bore pressure the effects of "continuous shrinkage" are also obtained. The layer which was stressed to the original tensile elastic limit of the steel cannot return to its original dimensions owing to the positive permanent deformations set up in inner layers. The layer next outside this one, in endeavouring to regain its original dimensions tends to compress all the layers under it, and retain in itself some residual tension. Each of the elastic layers, therefore, produces shrinkage effects on all layers under it, and these effects are continuous throughout all the elastic layers. The release of a bore pressure, which when applied sets up permanent deformations in the steel near the bore, produces the effects of "continuous shrinkage", "self-hooping" or AUTO-FRETTAGE, throughout the wall of the gun, that is the bore layer and some of the innermost layers will be in states of residual compression,

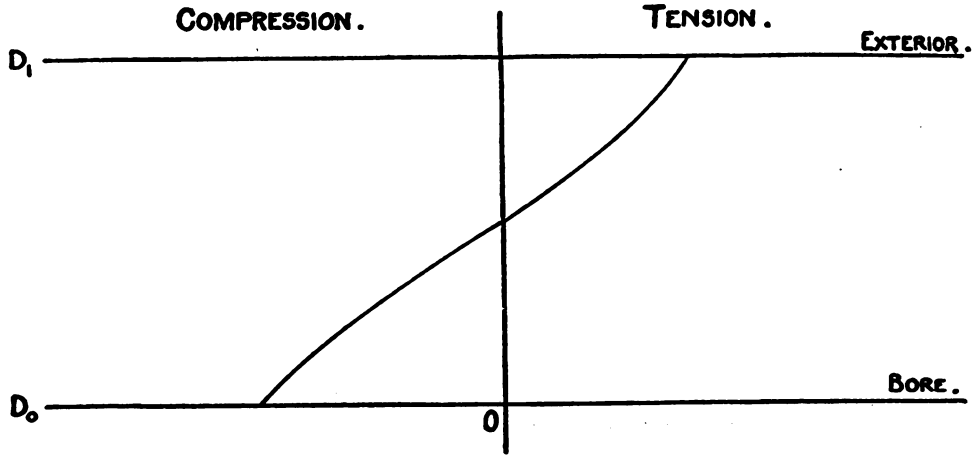

Figure 8.

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while the remaining outer layers will be in states of residual tension. Experiments have shown that in an auto-frettaged monobloc tube the residual stresses are of the order shown in the diagram of Figure 8.

Auto-frettage may be defined, therefore, in general terms, as the process of setting up the effects of shrinking an indefinite number of infinitely thin hoops on one another to make up the wall thickness of a gun, in such a way that innermost layers are in states of residual compression and outer layers in states of residual tension. These effects are produced by the application and release of a liquid bore pressure, which, when applied, sets up positive permanent deformation in some or all of the layers in the wall.

5. *Manufacture of a Q.F. 18 pr. Mk. IV Gun Body by the Auto-Frettage Process of Construction.*

A steel forging is made to the required external diameter and length, rough machined and bored, and oil hardened and tempered to pass the "Specification" test for acceptance for manufacture of a gun body. After acceptance the forging is prepared for auto-frettage. The exterior is machined to a diameter of 8·9 inches and the bore finished machined to 3·15 inches diameter, sufficient material being left on the exterior for the longitudinal guides of the gun. Each end of the forging is prepared for the "packings" to seal the liquid under pressure, each packing being held in position by plugs screwed into the forging. The breech end is drilled and tapped for suitable connections to a pressure intensifier, and the muzzle end for the necessary connections to a high pressure gauge used for measuring the liquid pressures applied. In order to minimise the quantity of liquid used in the process, a "core-bar", 0·1 to 0·2 inch smaller in diameter than the bore of the forging, is placed between the packings. This allows of an annulus of liquid between the "core-bar" and the bore.

The general arrangement of the forging erected for auto-frettage is shown in Figure 9.

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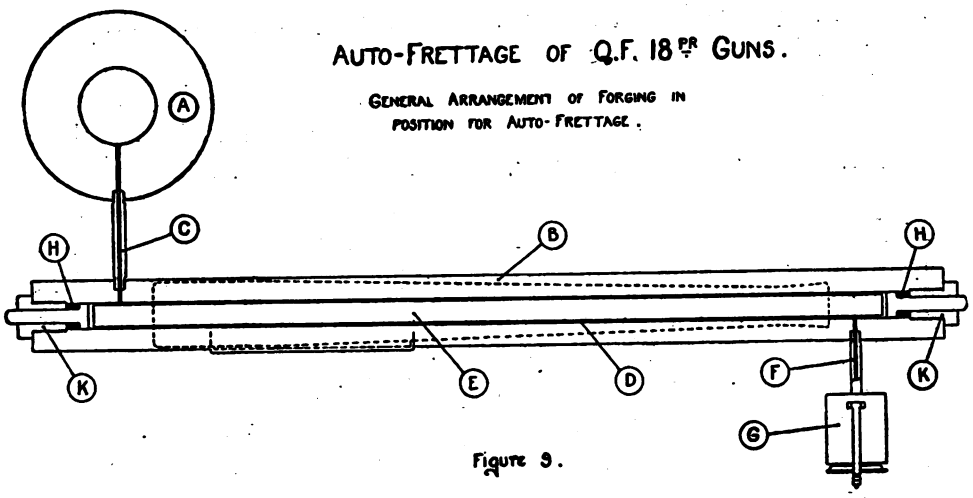

Figure 9.

The intensifier (A) and forging (B) are filled with glycerine; the intensifier being erected in a hydraulic press. Working the hydraulic press forces a plunger into the intensifier setting up liquid pressures in the intensifier, connection (C), annulus (D), between the "core-bar" (E) and the bore, connection (F) and high-pressure gauge (G); the packings (H) supported by the screwed plugs (K) sealing each end of the forging.

A pressure of the order of 30 tons per square inch is developed and measured, and, as it is a liquid pressure, it acts in a radial direction on the bore, expanding the forging to set up permanent deformations in some of the steel surrounding the bore. On release of the pressure, which is done by lowering the ram of the hydraulic press and allowing the plunger of the intensifier to be forced out, the wall of the forging closes in, but is unable to return to its original dimensions. Bore and exterior diameters will have been slightly enlarged by reason of the permanent deformation set up by the application of the liquid pressure, but the release of the pressure produces states of residual stress of the order shown in Figure 8.

After this auto-frettage operation the forging is given a special heat treatment which restores and increases the elasticities of the steel permanently deformed by the process. It is not proposed to discuss these alterations in elastic properties by heat treatment in this paper, but they are such as to make the forging elastic for

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repeated applications of liquid pressures up to, and including, the auto-frettage pressure.

To ensure that the process is complete, the forging is re-erected as shown in Figure 9 and the auto-frettage pressure re-applied several times; bore, exterior, and length measurements taken before and after this "test" showing that no alteration in diameters and length has taken place. The surplus material at each end of the forging is then parted off and the gun body, shown by broken lines in Figure 9, finished to plan, the breech ring is then shrunk on and the gun completed for proof.

This monobloc gun body is elastic for repeated applications of definite pressures at all sections throughout its length. These pressures are, of course, less than the auto-frettage pressure used on the forging, and, by reason of the different sectional areas of the gun body, vary from breech to muzzle of the gun. The gun, however, is elastic throughout its length for pressures greater than those set up at proof or on firing under service conditions, which ensures a factor of safety at any position of the gun.

In "built up" construction the initial, or residual compressions set up in an inner tube enabled a higher bore pressure to be used than would have been possible had the tensile elastic range of the steel only been available, by offering increased elastic resistance to the stresses set up on application of a bore pressure. The auto-frettage process is one in which the application and release of a liquid pressure on the bore of a forging sets up initial compressions in the bore layers in a more simple and cheaper way. It is hoped that the above descriptions will enable readers to understand what is meant by auto-frettage, and how the process is applied to the construction of guns in one piece, so that a monobloc wall is made elastic for pressures greater than those set up when a gun is fired.

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THE SERVICES OF THE ROYAL ARTILLERY IN THE FIRST BOER WAR, (1880-81).

By Major J. F. de F. Shaw, (late) R.A.

(Note.—The numbers given after the names of artillery officers refer to Kane's List.)

Authorities consulted.

"With the Boers in the Transvaal." By C. L. Norris-Newman.

"A Narrative of the Boer War." By T. F. Carter.

Accounts of the Siege of Potchefstroom. By Col. Winsloe, and Lieut. H. M. L. Rundle, etc., etc.

Early History of the Cape of Good Hope.

THE Cape of Good Hope was originally a Dutch Settlement, founded for trade purposes by the Dutch East Indian Company in 1652. The persecution of Protestants in Europe, however, in 1685 and succeeding years, resulted in an influx to the Cape of French Huguenots, Savoyards, Germans, etc., who readily accepted the offer of the Dutch settlers of a home. The newcomers at first retained their own languages, but before the close of the 18th century, a kind of Dutch patois (termed "Africander Dutch") had become the universal tongue.

The first British occupation of the Cape dates from 1795, and lasted until 1803, in which year the Colony was restored to the original owners. In 1806 Great Britain sent a second expedition against the Dutch, with the result that the Colony again changed hands, and has remained British ever since. From the outset, the British occupation was stoutly opposed by the Dutch settlers. The Colony, however, continued to progress and thrive, though subject to much trouble with the native tribes, as the settlers penetrated inland. This involved Great Britain in several wars of more or

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less magnitude, between the years 1806 and 1834. In the latter year, slavery was definitely abolished throughout the British Dominions. This measure was stoutly resisted by the Dutch element at the Cape, who contended that their control over the natives for labour purposes would be lost. In the same year (1834) commenced what is better known in the history of South Africa as the "Great Trek." The Dutch settlers had for some years past been dissatisfied with British rule, and sought for other lands further inland, where in addition to gaining their liberty and independence, they hoped to find better pasturage and water for their herds. The first movement was across the Drakensberg Mountains to Natal, where the Boers found an English settlement. After some years of fighting with the Zulus, an independent Dutch republic was proclaimed at Durban, but the Cape Government opposed this, and eventually (in 1843) Natal became a British Colony. Meanwhile the migration of burghers was progressing in other directions, especially to the northward beyond the Orange River, and even across the Vaal River, still further to the north and north-east. In 1838, a Boer Republic was proclaimed at Bloemfontein, in the Orange Free State, and in the same year new Dutch settlements were founded across the Vaal River.

In 1848, Sir Harry Smith, then Governor at the Cape, in response to a petition for aid from the Griqua tribe, sent a strong military expedition against the Free State Boers, and after inflicting a severe defeat on them at Boomplaats on 28th August 1848, the Free State was annexed as a British Colony, with a Resident at Bloemfontein. There was still no sign, however, of the new countries settling down to peace and quiet. In 1850, the Basuto tribe began to give trouble, and the British Government called upon the Boers to assist them to restore order. The latter refused to give any form of help. The Home Government accordingly recommended the withdrawal of the Sovereignty over the Orange Free State, and the granting of complete independence to both the Free State and Transvaal Boers. This was finally confirmed in 1854, and the two countries were left free to govern themselves. Their attempt at self-goverment was a dismal failure, mainly due to continual trouble with the natives, who bitterly resented the drastic and cruel methods practised by the Boers. Thus matters drifted

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on until 1871, when the first discovery of gold in the Transvaal was the signal for a rush of prospectors of every class and nationality. The necessity for certain developments (notably railways) with a view of opening up the goldfields, now became apparent. To meet the cost of these, a system of heavy taxation was introduced, but the Boers had always opposed taxation in any form, and bitterly resented the new laws. By the end of the year 1876, a state of political chaos had arisen, so great that the British Government was petitioned by a great majority of the inhabitants to step in and annex the Transvaal, and thus save the country from ruin. This proposal seems to have found favour with all save the Boers of the "Voortrekker" (early pioneer) stamp, who did not desire a reversion to British rule, but at the same time could suggest no alternative course. The Home British Government concurred with the proposals, and on the 12th April, 1877, Sir T. Shepstone formally annexed the Transvaal at Pretoria as H.M. High Commissioner.

The Inception of the Struggle.

The British annexation of the Transvaal was from the outset highly resented by the more extreme section of the Boers, who arranged to send a deputation to England at an early date to protest against this action. Meanwhile, the administration of the country was taken in hand, and a military garrison sent up to Pretoria from the Cape. The Boer deputation returned from England at the end of 1877, their mission having resulted in complete failure. A second deputation was sent home in July, 1878, the burghers being firmly convinced that they would secure their independence, if only the real facts of the situation could be brought home to the British Government.

In this same year (1878) trouble arose with Secocoeni, the chief of the Bapedi tribe. This rebellion lasted until the end of 1879, and took a strong British force to suppress it. Towards the end of 1878, the second Boer deputation returned from England, having likewise failed to extract any satisfactory promises from the Home Government. In the early days of the following year (1879) the Boers commenced to hold large mass meetings, at which they bound themselves in every possible way to co-operate to secure their freedom, and regain their country.

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The early days of 1879 mark two important events in the history of South Africa. The first of these was the appointment of Colonel Sir O. Lanyon as Administrator of the Transvaal, in relief of Sir T. Shepstone, who had voluntarily relinquished the appointment. The second event was the outbreak of the Zulu War. Shepstone's withdrawal was undoubtedly most unfortunate, for he had always been most successful in controlling and pacifying the most discontented section of the Boer population. Himself a colonist, he thoroughly understood both the country and the people, and entirely grasped the main causes of their grievances. The Zulu War was the outcome of a long-standing feud with Cetewayo, the Zulu King, over the boundary question. As the latter refused to come to terms, a military expedition under Lord Chelmsford was sent against him in January 1879. The war lasted until August of the same year, when Cetewayo was captured, and his forces dispersed.

After this war Sir Garnet Wolseley was appointed to the chief civil as well as military command in S.E. Africa, and proceeded to Pretoria in September 1879 to consider the question of the Boer grievances, which were now steadily gaining ground. The recent imposition of railway and other taxes, and the rather high-handed methods of collecting the same, combined with ill-advised imprisonments, united with other causes to increase the exasperation of the burghers. In addition, Sir Garnet's scheme for governing the Transvaal was not well received, and a statement by him at a public dinner soon after his arrival in the capital that "as long as the sun shone in S. Africa the Transvaal would remain British" did not tend to smooth matters. Everyone now felt that affairs were coming to a crisis. On the 15th December 1879, another great mass meeting of Boers was held near Pretoria, at which a good deal of violent language against the British Government was used. The garrison of Pretoria was increased by a wing of the 58th Regt. and a Volunteer Corps was formed from the loyal citizens.

In March 1880, Sir G. Pomeroy Colley was appointed Governor and High Commissioner for S.E. Africa, Sir G. Wolseley being ordered home to the War Office. Colley actually reached S. Africa in June 1880 and in addition to his civil appointment he was directed to take over command of troops in Natal and in the

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Transvaal, whilst Sir O. Lanyon was to continue to hold the position of Administrator to the latter country. The head of the Orange Free State at this period was President Brand, and it may be noted that this official had always been well to the front in wise counsel and acts for the good of S. Africa in general. Even now, at the eleventh hour, he stepped forward and tried to mediate between the Boers and the British Government, but, as will be seen, without avail.

The Bursting of the Storm.

The first actual outbreak occurred at Potchefstroom, in November 1880, when proceedings were taken against a Boer named Bezuidenhout for overdue taxes. Judgment was given against him, and in default of payment, a wagon of his was ordered to be put up for auction. On the day appointed for the sale, however, armed Boers seized the wagon by force and removed it. Reinforcements of troops were at once sent from Wakkerstroom to Potchefstroom, and the arrest and trial of the leaders of this outbreak ordered. This action, however, was stoutly resisted by the Boers, and in fact prevented. A mass meeting of Boers was held at Paardekraal, under P. Krüger, at which the Colonial Office was represented, and finally, on the 16th December, the country was proclaimed the South African Republic at Heidelberg, and a provisional government formed there. British military preparations continued, but as soon as these became known to the new Boer government, the British authorities were notified that no movement of troops within the Transvaal could be permitted.

II.

Distribution of British Troops in the Transvaal, and in Natal, in November 1880.

At this time, the British garrison had been very much reduced. The King's Dragoon Guards had recently departed for India, and the only units left included N/5 R.A.,[1] the 94th Regt., the 2-21st Royal Scots Fusiliers, and some Companies of the 58th Regt., with a small detachment of R.E. and administrative and departmental units. The actual distribution of regular troops in the principal garrisons was as follows:—

[1] Now 86th Field Battery, R.A.

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At Pretoria:—

1 Section N/5 R.A. (two 9 pr. guns.)
H.Q. } 2-21st Royal Scots Fusiliers.
4 Companies }
Detachment, R.E.

At Potchefstroom—(sent there after the Bezuidenhout affair) :—

H.Q. } N/5 R.A. with two 9 pr. guns.
1 Section }
Detachment 2-21st Royal Scots Fusiliers (about 180 all ranks.

At Newcastle:—

1 Section N/5 R.A. (two 9 pr. guns.)
2 Companies 58th Regiment.

At Lydenburg:—

H.Q. } 94th Regiment.
3 Companies }

The remainder of the troops being distributed in small detachments in the isolated garrisons of Standerton, Wakkerstroom, Middelburg, Marabastadt, and Rustenburg.

III.

The Bronkhurst Spruit Disaster.

One of the first actions of the military authorities, on learning of the Bezuidenhout affair, was to order the move of H.Q. and two companies, 94th Regt., from Lydenburg to Pretoria, to strengthen the garrison there. This little force, consisting of 257 of all ranks, under command of Lieut.-Colonel Anstruther, left Lydenburg by march route on 5th December. On the 20th December, the detachment left Middelburg early in the morning and about 1.30 p.m. on the same day, reached Bronkhurst Spruit (about 38 miles from Pretoria). Here the column was met by some Boers who ordered it to halt, and Colonel Anstruther was handed a written order from the Boer Government, directing him not to proceed further. The Colonel replied that his orders were to go to Pretoria, and that he intended to do so. A few minutes after receiving his reply, the Boers, who appear to have been 1200 or 1500 strong, and posted behind good cover, suddenly opened

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a heavy fire on the column, which after a short sharp engagement, lasting only ten minutes, was forced to surrender, having lost 64 killed and 92 wounded, or 67% of the force engaged.

Conductor Egerton, of the Army Service Corps, though wounded, volunteered to proceed to Pretoria to bring out doctors and ambulances, and at the request of Colonel Anstruther (mortally wounded), the Boer Commandant gave him a pass to go there. Sergeant Bradley, of the 94th Regt., accompanied him. Conductor Egerton, before starting, concealed the colours of the 94th Regt. round his body so as to avoid their being captured by the Boers, and so conveyed them safely to Pretoria, a distance of 40 miles. For this gallant act, he was afterwards given a commission in the 94th Regt.

The news of the disaster at Bronkhurst Spruit had hardly reached England, when it was followed by a fresh outrage, the murder by shooting of Captain Elliott, of the 94th Regt., while he was endeavouring to swim his horse across the Vaal River. By this time the outbreak had spread to such an extent, that the British garrisons were completely isolated in their respective posts in the Transvaal.

IV.

Operations during January 1881.

Major-General Sir G. Pomeroy Colley was now directed to assume the Government of the Transvaal, all available troops in Natal were ordered to Newcastle, and strong reinforcements were promised from home and from India. The Boers were now assembling in great force near the border, and in particular near the frontier line between Natal, the Transvaal, and the Orange Free State, where the main road to Pretoria crosses Laing's Nek over the Drakensberg Mts., to prevent the advance of the British Natal garrison to reinforce the besieged garrisons. With this object, a large force of Boers was also sent to Meekis as reserve, with other strong bodies in rear.

The 3/60 Rifles were now sent up from Natal to Newcastle to form an entrenched camp there. The R.A. at the latter station being very weak (only amounting to one section of N/5), Captain C. Greer, at this time in command, volunteered and

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obtained permission to organize and equip an additional section of field artillery from guns in store at Durban, horses purchased locally at Newcastle, and N.C.O's and men from No. 10 Battery, 7th Brigade, Garrison Artillery,[1] from Capetown. He further organized a section of two 7 pr. mountain guns, manned by men of the 60th Rifles with R.A. N.C.O's. By these means he increased the artillery strength from two to six guns.

On 22nd January 1881, Colley sent an ultimatum to the Boers, ordering them to disperse as insurgents. General Joubert's reply was to the effect that nothing short of the restoration of the South African Republic under British protection could be considered. His reply was forwarded to the British Government.

On the 24th a small relief column left Newcastle for the Transvaal, consisting of about 60 officers and 1200 other ranks, under Colley. Owing to the recent heavy rains, progress was slow at first, but on the 26th inst., the force halted and encamped at Mount Prospect, where an entrenched camp was constructed. About 3½ miles from the camp lay Laing's Nek, where a large Boer encampment was visible. A few skirmishes between opposing patrols occurred, but without casualties, and on the 28th a further advance was made, resulting in the action at Laing's Nek.

The Battle of Laing's Nek.[2]

The British troops engaged were as follows:—

Royal Artillery. 4 officers, 6 guns:—

2 guns (9 prs.) of N/5 R.A., fully horsed and equipped. (Capt. Vibart.)

2 guns (9 prs.) manned by men from 10/7 Battery, Garrison Artillery, drawn by horses and oxen. (Lieut. Parsons.)

2 guns (7 prs.) manned by infantry. (Lieut. Connolly.)

The whole under command of Capt. C. Greer, R.A. (2919), with Capt. A. M. Vibart, R.A. (3205), Lieut. C. Parsons, R.A.,[3] (3586), and Lieut. W. H. Connolly, R.A. (3761).

Infantry:—

5 Companies 3/60th Rifles under Col. Ashburnham.

5 Companies 58th Regt. under Col. Deane.

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[1] Now 18th Heavy Battery, R.A.

[2] From Official Despatch, dated 1.2.81.

[3] Afterwards Major-General Sir C. Parsons, K.C.M.G., C.B.

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Mounted troops:—

About 150 M.I. and K.D.G's under Major Brownlow;
also A Naval detachment of 75 all ranks, with rockets.
A small detachment Natal Mounted Police.

The Boer position was seen to be a strong one, but their numbers were unknown. The British force advanced to the west of the road, and about 9 a.m. reached some low ground at the bottom of the rise to the Nek. From here, the following dispositions were made.

The five companies of the 60th were extended to our left, with the naval detachment and Natal Police. The main attack was to be made by the five companies of the 58th Regt. against the left of the Boer position, to be covered by the fire of the artillery, with the mounted troops in rear of the guns. About 10 o'clock, the 58th Regt. was ordered to advance up a hill to the British right of the Nek, and the mounted squadron to charge a hill still further to our right, with the object of outflanking the Boer left. The cavalry got up first, but were forced to retire in face of a heavy fire, the enemy being behind good cover, and the ground most unsuitable for a cavalry charge. The casualties to the squadron were heavy, especially in horses.

The companies of the 58th Regt. got half-way up the hill without any great amount of opposition or loss, but when close to the Boer position, and in the act of extending, the order to charge was suddenly given before the extension had been completed; the enemy now opened a heavy fire which shook the attack considerably, being both frontal and enfilade fire. The British artillery had opened fire on the enemy's position at 10 a.m., but as the main body of the Boers were on the side of the ridge furthest from Mount Prospect, they lay in comparative safety from shell fire at first. The 58th Regt., encouraged by the officers, both staff and regimental, soon rallied and drove the more advanced Boers back on their supports, but the enemy being by this time reinforced and the enfilade fire on the right increasing, the order to retire was reluctantly given at 11.30 a.m., nearly all the officers being either killed or wounded. Conspicuous among these was Major T. R. Poole, Royal Artillery (2876). (attached to the staff), who was killed whilst endeavouring to rally the infantry.

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The retirement of the companies of the 58th Regt. was carried out in the face of a heavy fire in an orderly manner, and was most effectively covered by the excellent shooting of our guns on the right. The 60th Rifles had been exposed throughout to a heavy cross-fire from a ravine on the British left, and on the 58th reaching the flat, the Rifles were ordered to the front, to assist in covering the retreat. The Boers did not follow up the retirement, and Sir George Colley fell back on Mount Prospect, thinking the enemy's position too strong and well defended for his small force to tackle. Military and other critics are strongly of opinion that the guns were ordered to cease firing too early in the engagement, and just as their fire was beginning to be felt by the enemy. Speaking of the Royal Artillery on this occasion, the Major-General in his official despatch stated:

> "Much credit is due to Capt. Greer and Lieut. Parsons for the efficiency of my artillery forces, seeing that these were originally only two guns properly manned and equipped in this country, the other four having been equipped and horsed locally, and manned partly by artillerymen from a garrison brigade and partly by volunteers from the 60th Rifles."

The British casualties at Laing's Nek amounted to 7 officers and 76 other ranks killed, 2 officers and 109 other ranks wounded, 2 other ranks missing. The Boers are stated to have lost 14 killed and 27 wounded.

VI.

Subsequent Events and Arrival of Reinforcements.

When the news of the failure at Laing's Nek reached England, the despatch of reinforcements was hurried on. Brigadier-General Sir E. Wood, V.C., was appointed to the post of 2nd in Command in S. Africa, on account of his knowledge and experience of the Transvaal, and though senior in army rank to Sir G. Pomeroy Colley, he made no objection to the appointment. Many special service officers were also appointed, and on January 25th the 2/60th Rifles, 15th Hussars, and F/3 R.A.[1] landed at Durban from

[1] Now 85th Field Battery, R.A., also C/1 Field Battery, R.A. (now 3rd Field Battery, R.A.), arrived from home on the same date.

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India, followed a few days later by the 83rd and 92nd Regts. The 2/60th with the 15th Hussars and some Natal Mounted Police were hurried up to the front, and the 92nd Regt., with a Naval brigade and some rockets, were also sent to Newcastle. It was decided to form a camp on the Biggarsberg, between Ladysmith and Newcastle, and to concentrate a column there for the relief of General Colley, who was by now in a critical position at Mount Prospect, being cut off by road from Newcastle, and short of ammunition. The Boer raiding parties were at this time most troublesome, capturing convoys and hindering postal services in the Newcastle district. The 97th Regt. was disembarked at Durban on February 4th, and ammunition and remounts also arrived from Capetown. On the same date, Major-General Colley wired from Mount Prospect, that all was quiet there, that he had news from Pretoria that it could hold out for several months, and that the other besieged garrisons were also holding out. On February 7th the Boers attacked the mail cart from Mount Prospect to Newcastle at Ingogo, and the mails and escort were forced to retire on Mount Prospect. The enemy was reported to be now within 10 miles of Newcastle, and the telegraph line was liable to be cut at any moment. The following day the Major-General decided to open up the road to Newcastle and clear off the enemy from that neighbourhood.

The Fight on the Ingogo (Schuins Hoogte).[1]

8th February, 1881.

At 9 a.m. on February 8th, Colley left the camp at Mount Prospect with five companies of the 60th Rifles, two 9 pr. guns of N/5 R.A. and two 7 pr. guns, R.A., and a small mounted detachment of only 38 men. As the object of the movement was merely a demonstration in force, no rations were carried, nor even a water-cart taken with the force.

One company of the Rifles, and the two mountain guns, were left on the heights on the Mount Prospect side of the Ingogo River, the rest of the force then crossed the river, with scouts out in front and on the flank. There was no sign of the enemy until the troops commenced the ascent on the opposite side of the river, when

[1] From Official Despatch, dated 12.2.81.

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shots were exchanged by advanced scouts on both sides. The infantry, in extended order, now climbed to the top of the plateau, where the Boers were reported to be in great strength. The enemy now galloped forward to dispute the ridge. Our 9 prs. were unlimbered on rising ground, and speedily came into action, but the Boers, being by now behind the excellent cover offered by the ground, opened a heavy and effective fire on both guns and infantry, at the same time endeavouring to turn our right flank. To meet this attack, the 60th were still further extended, and the action then became general.

The British position was on a small plateau, triangular in shape, forming a portion of the main ridge and connected to the latter by neks slightly lower than the plateau itself. The Boer attack was directed against the south and west faces of the triangle, and the eastern angle. The two 9 pr. guns were now advanced to the centre of the plateau, one being posted on the south edge, directed by Capt. Greer, and the other on the north side, under Lieut. Parsons. There was practically no cover for them, however, against the enemy's fire, and they suffered severely in casualties both to personnel and horses. The Boer right being very much extended and exposed, a fairly strong mounted force could easily have turned it, but of course no movement of this nature could have been attempted by the very reduced mounted detachment, only 38 strong at the commencement of the action.

Captain Greer, R.A., was killed early in the engagement, whilst directing the fire of his gun, his fearless behaviour, as also that of Lieut. Parsons, being most marked, both officers setting a splendid example to their men. Eye-witnesses have declared, that artillery fire could hardly have been maintained under more adverse conditions than on the Ingogo. Gun ammunition was now beginning to get short, and on this account, and also from the heavy casualties to the R.A. personnel, the General ordered their withdrawal from the exposed position they held, with the result that their fire was now only at long range, and only effective against occasional exposures of Boer reinforcements.

As soon as it was clear that the Boer attack was sustained, and was moreover being reinforced, the General ordered three companies of the 58th Regt. to move out from Mount Prospect and

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occupy the ridge north of the Ingogo, and later on to push across the river towards the British position. The action commenced at 12 noon and continued without intermission until 3 in the afternoon, when the Boer fire began to slacken off, and it looked as if the enemy had abandoned the idea of gaining the position. The British troops continued firing with great coolness and steadiness, and without wasting ammunition. About 4 p.m. the Boers began to collect their wounded, and to draw off on the British left, and towards sundown the fire slackened still more, and the enemy began to withdraw to the valleys on the British right. By dark the firing had ceased entirely.

Rain now began to fall in torrents, and the General, not having intended to remain out for the night, and consequently not having brought rations or water supplies, and also perceiving that the Boers were preparing to renew the fight next morning in increased strength, decided to withdraw with his force to camp. The wounded were collected in one place and made as comfortable as the circumstances admitted, though suffering terribly from lack of food, water and first aid appliances. They were left in the care of the medical officer, and of the chaplain (the Rev. Mr. Ritchie), who had accompanied the column. The withdrawal of the artillery was a matter of some difficulty, owing to so many of the horses having been shot, and it was only just possible to horse the two guns by using all available animals. In spite, however, of the stormy night, and difficult ground, the movement was executed in excellent order, and the crossing of the river, which was far from easy owing to the heavy rain, was accomplished without loss of life. The infantry assisted to drag the guns back to camp, as the horses were quite unable to negotiate the steep and slippery slopes.

The British casualties at the Ingogo amounted to 5 officers and 61 other ranks killed, 4 officers and 64 other ranks wounded, 1 officer, 8 other ranks missing. The R.A. casualties comprised Capt. Greer and 3 other ranks killed, Lieut. Parsons and 10 other ranks wounded.

Major-General Sir G. Pomeroy Colley, in his official despatch on the action, pays the highest possible tribute to the conduct of the R.A., as the following extracts will show:

"The Major-General Commanding desires to express his high

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appreciation of the conduct of the officers and men of the Royal Artillery and 60th Rifles in the action fought yesterday against vastly superior numbers. The R.A. well maintained the splendid reputation of that corps by the way they served their guns under a murderous fire and brought them out of action, notwithstanding their heavy losses in men and horses. . . . The Major-General has to deplore the loss of Captain Greer, R.A., who was killed at his guns, setting a noble example, worthily followed by the men under him. By his death the Royal Artillery have lost a gallant and valuable officer. . . . The Major-General feels sure that the force under him will join with him in specially recognizing the distinguished conduct of Lieut. Parsons, R.A., who directed the fire of the artillery in a most exposed position until two-thirds of his men were killed or wounded, and he was consequently ordered to retire, and who was afterwards severely wounded while directing and refitting his guns. . . . . I also desire to mention specially the conduct of Sergeant-Major T. Toole, R.A., who well seconded Captain Greer and Lieut. Parsons in working the guns until the end of the action and on whom the arrangements for the withdrawal devolved, when the latter officer was wounded." . . . .

The above extracts were also repeated in a General Order issued at Mount Prospect Camp, dated 9th February, 1881.

VIII.

The Course of Events from the 9th to 26th February.

In the meantime, General Sir Evelyn Wood had arrived in Natal, and the 6th Dragoons, some field artillery, and mounted infantry, with drafts and details, had arrived at Durban. In addition, two extra cavalry regiments, two field batteries R.A., and an infantry battalion, were promised from England.

The day after the Ingogo fight, Major-General Colley received the following telegram from the Secretary of State for War :

"Inform President Brand[1] that if Boers cease from armed

[1] Then President of Orange Free State and an active mediator between Boers and British Government.

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opposition, H.M. Government will be ready to give all reasonable guarantees after submission, and that schemes will be formed with a view to permanent friendly settlement of difficulties, and that H.M. Government will be glad if President will communicate this and former messages to him to Boer leaders."

The 83rd Regt. was ordered up at once to the front on arrival. On the 13th February, the road between Newcastle and Mount Prospect was free from Boers, but large bodies of the latter were south of Newcastle, and moving towards the Biggarsberg; they were seizing horses and transport, burning the wagons and looting the stores. On the 14th, communication by helio with the Biggarsberg camp was established.

The following day General Sir E. Wood, with the first reinforcements, consisting of the 15th Hussars, 2/60th Rifles, 92nd Highlanders, and a naval detachment with two guns, marched from the top of the Biggarsberg to a distance of eight miles towards the Ingagani River. Continuing the march, the column reached Newcastle without opposition at noon, when Major-General Colley rode in from Mount Prospect to meet General Sir E. Wood. After a lengthy discussion of the situation, the two Generals decided that no further advance should be made until considerable reinforcements were available, since the Camp at Mount Prospect was quite safe, and Newcastle afforded a good centre for reconnaissance. The main body of Boers had by now fallen back behind their line at Laing's Nek, and were being strongly reinforced. They were continuing to make constant raids on transport and farms within their reach.

On February 18th, General Sir E. Wood carried out a reconnaissance in force from Newcastle with a squadron of the 15th Hussars and two companies of the 92nd Highlanders towards Wakkerstroom; and on the 22nd inst., the Indian column left Newcastle for Mount Prospect with stores, provisions and ammunition. Some troops (including two 9 pr. guns of N/5 under Lieut. Connolly, R.A.) were posted on the heights over the Ingogo, to establish a fort and entrenched position there. On the 24th, General Sir George Colley left Mount Prospect with all the cavalry and two 9 pr. guns for a high hill to the east of the camp,

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overlooking the Boer camp. After the return of the British force, the enemy sent a strong body to occupy the same hill, but this force was soon shelled out of it by the British guns at 5800 yards range.

Peace negotiations were still going on between the British Government, President Brand, and General Sir G. Pomeroy Colley, and on the 25th February, the following telegram was sent; From

High Commissioner, Mount Prospect.

To

President Brand, Bloemfontein.

"Lord Kimberley desires me to thank your Honour for the friendly offer, which H.M. Government will not fail to bear in mind, if the answer received from Mr. Krüger[1] leads to the appointment of a Commission."

IX.

The Fight on the Amajuba Mountain.[2] 27th February, 1881.

On the evening of Saturday, February 26th, General Sir G. Pomeroy Colley moved out of camp at Mount Prospect, on a secret expedition, with three companies 58th Regt., three companies 92nd Highlanders, one company 3/60th Rifles, a naval detachment, and two 9 pr. guns from N/5 R.A.—also a small detachment 15th Hussars. In all 554 rifles, with two guns. Three days rations and 70 rounds of rifle ammunition per man were taken. The objective was the high hill known as the Amajuba or Spitzkop, to the north-west of the British camp, which overlooked and commanded the Boer camps beyond Laing's Nek. The company of the 60th Rifles was left at the foot of the hill, together with the cavalry, all horses, and the reserve ammunition. The guns were now sent back to Mount Prospect, it being clear that it would be impossible to get them to the top. The little force was guided by Kaffirs up the steep slopes of the mountain, so precipitous in places that the men could only crawl on hands and knees. It took nearly six hours to reach the summit, which was gained just before daybreak. As soon as it was light, breakfasts were prepared, and water was dug

[1] S. P. Krüger, then recognised leader of the Transvaal Boers.

[2] From "With the Boers in the Transvaal"; by C. L. Norris-Newman.

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for. The Boer camp was now becoming very animated, and as soon as the enemy had recovered from the surprise of learning of the British occupation of the hill, General Joubert sent out a strong force to attack it.

The Boer advance was made in three bodies, from the north, east, and west, widely extended, a fourth party remaining below to open fire on any British soldiers who showed themselves on the hill, while a fifth detachment proceeded to work round the base of the hill, to cut off the retreat to the south. Firing commenced about 5 a.m., and continued steadily from both sides until 11.30 a.m. A company of the 92nd Highlanders, who had been left on a plateau below and to the south-west of the main position and had dug themselves in there, also became engaged early in the fight. The small force on top of the mountain had improvised a parapet of rocks and stones, on the nothern crest, as some slight protection against the fire of the Boer marksmen below, which same fire was intended to distract the British from the stealthy and almost unseen advance of the three storming parties, creeping up on each flank through the ravines and rocky ground. All this time, signalling communication was being maintained with the camp at Mount Prospect, and messages confident of success were being sent by General Colley.

About 1 p.m. the enemy suddenly opened a very heavy fire on the British left. All available reserves were at once rushed up into the firing line to meet this. The Boer fire has been described by eye-witnesses as most intense and accurate, and such that no British soldier could expose himself without several shots being fired at him. The British officers showed a splendid example in rallying and encouraging the men, but after a few minutes' desperate fighting the ammunition began to give out (the reserve ammunition, as will be remembered, having been left at the bottom of the hill). Bayonets were now fixed, and a few charges made, but our men continued to fall back under the murderous fire to which they were exposed, and soon there were no more than about 100 all told left with the main body, with whom were also the General and staff. These few remaining men were very soon compelled to retire down the mountain to save themselves from total annihilation, Major-General Colley being killed whilst

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attempting to rally the fugitives (according to one account, he was on the point of giving the order to cease firing when he fell).

The Boers attempted to cut off the retreat of our men at the foot of the mountain, but this movement was effectively checked by the fire from the British guns under Capt. Vibart, R.A., which had moved out from Mount Prospect with some infantry, as the result of the fight became apparent, and the retirement to camp was carried out in good order. Later on the wounded, and the body of the deceased General, were brought in under a flag of truce. The British casualties in this disastrous action amounted to three officers and 82 other ranks killed, 2 officers and 122 other ranks wounded, 7 officers and 50 other ranks prisoners, and 1 officer and 12 other ranks missing.

X.

Events up to and including the signing of the Peace Terms.

The news of the Majuba disaster, and of the death of Sir G. Colley, was received with the greatest consternation and gloom throughout South Africa and the British Empire. General Sir E. Wood was at once proclaimed Administrator and Deputy High Commissioner for S.E. Africa and further strong reinforcements were ordered from home and from India, with Sir Frederick Roberts appointed to the chief command. The reinforcements ordered amounted to three cavalry regiments, six infantry battalions, a field battery R.A., and a naval brigade 1000 strong from the Cape squadron (if necessary).

Major-General Sir E. Wood was now in constant communication with President Brand, General Joubert, and the British Government, on the subject of peace negotiations. As a consequence of this, on the 5th March, General Sir E. Wood and his staff held a meeting with the Boer leaders between Mount Prospect camp and the Boer lines, and an armistice to last for eight days was arranged, to allow time for the Boer reply to the peace proposals. Each side agreed not to make any forward movement from their respective frontiers, and General Joubert consented to allow supplies of food (but no ammunition) to be passed through to the various isolated British garrisons in the Transvaal, and also

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to the withdrawal of all British wounded. Apropos of the supply arrangements, however, it may here be remarked that in no single instance did any of these supply columns ever reach their destinations. They were doubtless looted "en route" by the Boers.

On the question of peace terms, the Transvaal Government was emphatic, and their demands included:—

(a) Complete amnesty of all leaders.
(b) Freedom from British rule (except suzerainty).
(c) No interference in internal affairs.

Owing, however, to a delay in the arrival of President Brand, it was found necessary to extend the armistice until March 18th. Meanwhile the reinforcements of British troops, as they were landed, were pushed rapidly up to the front, so as to be at hand in case of emergency.[1] On the 18th March, President Brand still not having arrived, a further extension of the armistice became necessary, and finally, on the 21st and again on the 23rd, meetings were held and a settlement agreed upon. Briefly, the main features of the terms were as follows:—

(a) The Transvaal Government agrees to accept the suzerainty of Great Britain, with a British Resident in the capital.
(b) A Royal Commission to be appointed to decide on the functions of the Resident, and on the provisions for the protection of interned natives, and boundary questions.
(c) The British Government to acknowledge the right of the Transvaal to entire self government (subject to suzerain rights).
(d) The Transvaal Government to co-operate with H.M. Government in punishing those guilty of deeds against the laws of civilised warfare.
(e) Major-General Sir E. Wood agrees, on the evacuation of Laing's Nek by the Boers, and dispersal of the latter, not to take possession of the position, or to follow up with troops.
(f) The Royal Commission to sit as early as possible, and the Government of the country to be restored within six months.

[1] It has been stated on good authority, that the Boers, alarmed at the big concentration of British troops on the border, were about to give in without further fighting, when the Gladstone Government surprised them by surrendering.

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(g) The Boer forces now under arms to disperse at once.
(h) All property taken by either side during the war, to be restored as early as possible.

These terms having been finally confirmed and signed, the Boers broke up on the 24th March 1881, and arrangements were completed for the withdrawal of the various British garrisons, and for the return of all prisoners-of-war. It now merely remains to give accounts of sieges of those isolated garrisons in the Transvaal, in which the Royal Artillery participated.

XI.

The Siege of Pretoria.[1]

In November 1880, the garrison of the capital consisted of:—
1 Section N/5 R.A. (two 9 pr. guns and two wagons, fully horsed and equipped), commanded by Lieut. E. M. Hare, R.A. (3766), with about 40 N.C.O's and men.
Two 7 pr. guns manned by volunteers.
H.Q. } 2-21st Royal Scots Fusiliers.
4 Companies }
1 Company, 94th Regt.
Detachment R.E.

Also a volunteer force comprising:—
The Pretoria Carabineers.
Nourse's Horse.
The Pretoria Rifles (6 companies).

Total effective strength about 1000 all ranks, with Colonel Bellairs, C.B.,[2] as Commandant.

For a few days after the receipt of the news of the Bezuidenhout affair at Potchefstroom, a period of anxiety and suspense ensued, until Conductor Egerton and Sergt. Bradley arrived on foot from Bronkhurst Spruit, bringing news of the disaster to the 94th Regt. on 20th December. Sir Owen Lanyon at once proclaimed martial law, and a defence scheme was prepared. It was decided that the town must be abandoned, as the garrison was insufficient to hold so large an area. The evacuation commenced at once, a military camp being formed outside the town. The total numbers in camp, including military, civilians, women, children and natives totalled up to about 3700. All available horses were commandeered for

[1] From "With the Boers in the Transvaal"; by C. L. Norris-Newman.
[2] Formerly D.A.G. at Capetown.

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the volunteers, and the overflow from the camp, comprising a number of the women and children, were accommodated in the Loretto Convent and grounds, close to the camp, and fortified by barricades and sandbags. The defence of the convent and grounds was entrusted to the volunteers (infantry). A short distance beyond the camp lay Fort Royal, commanding the approach to Pretoria from the south, and on two hills further to the south were Forts Tullichewan and Commeline, commanding the Heidelberg and Potchefstroom roads respectively. Fort Campbell lay still further to the south-east. The main camp, strongly fortified, was held by the 21st Royal Scots Fusiliers, under Colonel Gildea, the guns being divided between this position, Fort Campbell and Fort Tullichewan.

On the 19th December, the first shots were fired, when a patrol from camp met some Boers on the Potchefstroom road, but no casualties occurred, and again on the 28th of the same month another affair of patrols took place at Six Mile Spruit, where the British lost one man wounded and one captured, and wounded several Boers. The first serious conflict took place the following day (the 29th) when Colonel Gildea led a strong force out as far as Springhaasfontein (near the Six Mile Spruit). His command comprised: R.A.—two 9 prs. under Lieut. Hare, R.A., Royal Scots Fusiliers—198, 24th Regt. Mounted Inf.—36, Mounted volunteers—102. A sharp fight followed on meeting the enemy, but unfortunately the volunteers misinterpreted certain orders, and attacked a strong position from which they had to retire with severe loss. The column returned to camp, having accomplished nothing.

The most important action of the siege was that of the 6th January 1881, when the Boers were attacked at a position held by them at the Pienaars River, 12 miles to the north-east of Pretoria. Colonel Gildea's force on this occasion comprised about 470 regular and volunteers, with one 9 pr. gun of N/5 R.A. A detachment of Nourse's Horse was sent on ahead to reconnoitre, and then to occupy some heights a mile to the south of the Boer position. Colonel Gildea pushed on with the remainder of the force, and on arriving at the position selected for the volunteers found the latter already engaged with the enemy. After about twenty minutes' fighting the Boers put up a flag of truce opposite the left

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of the British line, and Colonel Gildea ordered "cease firing" and advanced with two orderlies and a white flag towards the enemy. The latter started to disperse, but a minute or two later some Boers still in position under cover fired a volley at the British flag of truce party. The British force then advanced and successfully turned the Boer right, whereupon the enemy surrendered. The column then started for home with 16 prisoners. On the way back the Boers attacked again, but were effectually driven off by the 9 pr. gun. In addition to the prisoners the enemy lost 4 killed and 16 wounded.

January 16th was the date of another unsuccessful attack on a Boer laager at Elandsfontein. Colonel Bellairs commanded in person on this occasion, but here again, due to some misinterpretation of orders, the column had to retire in the face of a strong flank attack. Fortunately the British casualties were very light. On the 24th January, and again on the 7th February, the artillery effectively shelled a Boer laager near Wonderboom Poort.

The last engagement of any importance and by far the most disastrous for the defenders, was an attempt to capture the Red House and destroy the Boer laager, on February 12th. Colonel Gildea left camp at 2 a.m. with two 9 pr. guns of N/5 R.A., 1 rocket, and about 550 of all ranks of regulars and volunteers, the objective being the Red House kraal, 7 miles from camp on the Heidelberg road. At daybreak the force reached the Six Mile Spruit, and a detachment was sent across to occupy a house on the far bank; meanwhile the Pretoria Carabineers had pushed ahead a mile to a ridge above Springhaasfontein. The Carabineers advanced with the idea of occupying a large stone kraal about 1000 yards to the British left of the Red House kraal. On nearing the position, however, they were met by a very heavy rifle fire from the enemy, whose marksmen were well protected behind the walls of the kraal. The guns unlimbered at once and came into action, but the Boers had by now turned the left flank of the volunteers and had driven them back. The enemy now made a general advance in great strength, forcing our troops to retire, Colonel Gildea being severely wounded and unable to continue the command. The retirement to camp was well covered by the guns and mounted volunteers, but according to some accounts

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the infantry never fired a round. The British losses in this affair amounted to 1 officer and 8 other ranks killed, 1 officer and 8 other ranks wounded, also one surgeon, and 2 men, Army Hospital Corps, with an ambulance, captured. This practically terminated hostile operations during the siege.

On the 22nd of March, Colonel Bellairs published a district order, thanking the garrisons and civil populations of the various besieged places in the Transvaal for their valuable services during the trying campaign, and for their fortitude and coolness during a period of anxiety and suspense. The following day, three British officers with despatches arrived from General Sir E. Wood, and on the 24th March, the terms of peace were made public. These were received with the greatest disgust and indignation by all loyal Britishers and Colonials, who declared that the British Government had betrayed them. Martial law was at once repealed, and the town re-occupied by the British, Mr. Gladstone was burnt in effigy in the Market Square, and more than one officer tendered his resignation from the army in disgust. The total British casualties during the siege of Pretoria amounted to 1 officer and 15 other ranks killed, 4 officers and 33 other ranks wounded.

XII.

The Siege of Potchefstroom.

The British garrison of this town on the outbreak of war consisted of:—

H.Q.
1 Section } N/5 R.A. (two 9 pr. guns).

under Major C. Thornhill, R.A. (2606), with Lieut. H. M. L. Rundle,[1] R.A. (3712), as Section Commander, with about 180 all ranks of the 2/21st Royal Scots Fusiliers, and a few civilian volunteers. The Commandant was Colonel Winsloe, 2/21st Royal Scots Fusiliers. As soon as it was clear that the Boers meant to fight, defensive measures were at once taken in hand. The town of Potchefstroom was a long straggling place, covering quite a mile of ground, and quite unsuitable for defence by even a much larger force than that available. The flat outside was so extensive, that

[1] Now General Sir H. M. Leslie Rundle, G.C.B., G.C.M.G., G.C.V.O., D.S.O., Colonel Commandant, R.A.

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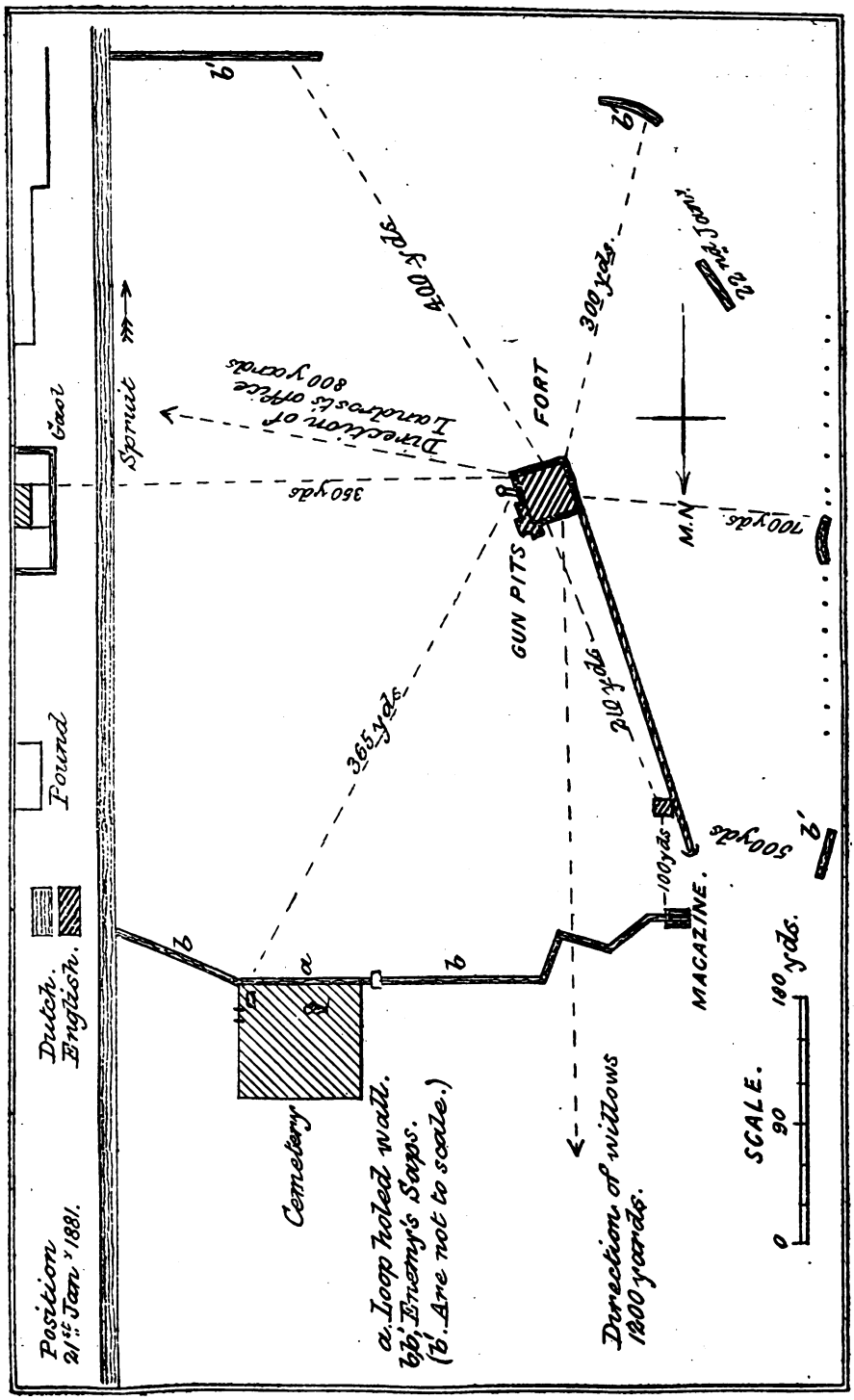

The Siege of Potchefstroom.

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there was no commanding position within gunshot outside the four corners of the place, and consequently no choice in the selection of a site for a fort. The first steps were to fortify the court house and jail, and to take all possible precautions against a siege. The garrison (after deducting the detachments required to hold the above-mentioned buildings) was relegated to the fort, an earthwork about 30 yards square and 1000 yards from the court house. In this work were placed the two 9 pr. guns, and a few civilians who elected not to remain in the town were also accommodated in it. As many provisions as could be collected in the time available were also stored in the fort, and the ammunition was removed from the magazine and distributed to the troops.

On the 14th December, a strong force of Boers was reported about 5 miles away, and the troops were at once despatched to their posts. The court house was garrisoned by 20 men of the Fusiliers, with 46 volunteers and armed civilians, under Capt. Falls, 2/21st Regt., and another 20 Fusiliers were allotted to the jail. The latter, a substantial stone building, was barricaded where necessary with sandbags, and the court house, of brick with a thatched roof, was also put in a state of defence. The civilians who took shelter in the fort included the Portuguese Consul-General (Mr. Forsman), six ladies, and several children. Some of these, but not all, were subsequently permitted by the Boers to return to the town, after the siege had lasted some time. The two 9 pr. guns were at first placed just outside an angle of the fort, covering the magazine and jail, and exposed to the fire of the enemy. To counteract the latter, a breastwork was thrown along the face looking towards the magazine, and this work being continued round the angle where the guns were placed afforded some protection to the guns, and to the gunners when off duty at night.

Colonel Winsloe, in his interesting account of the siege,[1] gives a graphic description of the hardships suffered by the civilians—especially the women and children. A few tents, and some coverings made out of sacks, constituted the sole shelter from the weather for the latter. Owing to its low-lying site, the fort could not be drained, and the garrison had to lie on the wet ground. The ladies went into the fort with just what they stood

[1] "The Siege of Potchefstroom"; by Colonel N. W. C. Winsloe, R. Scots Fusiliers. (Macmillan's Magazine, April, 1883).

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up in, and lived for three months in a shelter made of mealie sacks 5 ft. square and 9 ft. high with a small hole at the bottom to creep through, and a small shelter for meals adjoining. When, however, the Boers placed their gun so as to take the front parapet in reverse, the ladies had to retire to a "dug-out" when the gun was in action, and sleep in a tent at night.

On the 15th December, 1880, 500 armed mounted Boers entered the town and occupied it, holding all the entrances to streets, with piquets pushed out to the drifts leading to the town. The enemy proceeded to attack the fort on two sides, but were repulsed by artillery fire before the attack had developed. They also attacked the jail, Capt. Falls being killed early in the day, and 4 Fusiliers and 1 civilian wounded. The enemy next got possession of all buildings round the market square, and kept up a constant fire all night, and all day on the 17th inst., to which however, the British artillery responded. On the night of the 16/17 December, the water supply to the fort was cut off by the Boers. In the meantime, a well had been sunk in the fort to a depth of 20 feet, but no water obtained. The water barrels only held enough for two days more, at the rate of two pints per head daily. The weather was very warm, and the work consequently was a great strain on the garrison on so small an allowance of water.

On the evening of the 17th, Lieut. Lindsell of the Royal Scots Fusiliers led the water carts out to a stream half a mile away and filled them, with an escort of 25 mounted N.C.O's and men of the R.A. acting as cavalry, and a company of the Fusiliers. This dangerous undertaking was most successful, and quite unopposed, the enemy not being on the "qui vive" in this direction. Enough water was obtained for two more days at the same rate as before. The same night (the 17th December) the Boers broke through the wall of the stable behind the court house and got into it, thus being able to open fire at 8 yards' range. The garrison broke a hole through the roof which enabled them to signal to the fort, and direct the artillery fire. Colonel Winsloe signalled back to retire on the fort, but this was impossible, as they were surrounded.

On the morning of the 18th, the enemy set fire to the thatched roof of the court house, and the garrison was compelled to sur-

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render. This was done on condition that the lives of all in the court house should be spared. The Boer Commandant having agreed to this, the defenders were removed as prisoners-of-war to a house in the town. On December 19th the last drop of water in the fort was finished. Colonel Winsloe offered a reward of £5 to the party which first struck water, and several new wells were started. Very soon the R.A. party struck water at 9 feet, and this well afforded an ample supply for the remainder of the siege. Desultory firing by the enemy was constantly maintained, and, on the 21st, the small garrison of the jail was forced to evacuate, and retire on the fort, being very short of food. The Boers occupied the abandoned jail next day, but were soon shelled out of it by the 9 prs. from the fort. On the 20th all horses (except one) and all mules and oxen, were turned adrift, owing to scarcity of water. New Year's Day, 1881, marked the commencement of a very greatly increased fire on the part of the enemy who were by now nearly 2000 strong. On the 5th January, the attackers having occupied the cemetery, only 300 yards away on the British left front, Lieut. Lindsell, with a party of volunteers, drove them out by moonlight, and forced them to retire on the town.

On January 22nd, Lieut. Dalrymple-Hay, 2/21st Royal Scots Fusiliers, led a most successful sortie and attack on the enemy's trenches, capturing 4 prisoners, 6 guns, ammunition, tools, etc. On this occasion, Drivers Gibson, Martin and Pede of N/5 R.A., greatly distinguished themselves by carrying back two men dangerously wounded, under a heavy fire. After this sortie, the Boers brought up a 3 pr. gun to within 1000 yards of the fort, with which they made very good practice, firing 150 rounds in two days. Our gunners did their utmost to retaliate, but the enemy kept on shifting their guns to such an extent that it became impossible to locate them.

Colonel Winsloe goes on to relate an amusing anecdote of Lieut. Leslie Rundle, R.A., a young officer who may be said to have founded a subsequently distinguished career at Potchefstroom, and whose versatility was a marked feature of the siege. It would seem that the silence at night-time, with so little to divert it, became very irksome, and Rundle appears to have felt this even more than the rest. He would constantly approach the Commandant and

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say, "would you allow me just to give a screech." The requisite permission would be given, on condition that the sentries were first warned, in case they might start firing inadvertently. Then Rundle would scramble on top of the parapet, and commence a series of most unearthly and blood-curdling yells. The Boers, not understanding, would promptly open fire, but Rundle would be down in no time, feeling all the better for the exercise.

Amongst many requirements was a Union Jack. This was improvised in the gun pits by the men of N/5 R.A. The flag was made from the white and blue linings of the cloaks of an officer and sergeant in the R.A. and from a serge "jumper" sacrificed by an infantry officer.[1] For two months it displayed its folds on the parapet, a visible sign that the small garrison had still some life left. After the siege N/5 were permitted to retain the flag, which had a good many bullet holes to bear testimony to what the garrison had gone through. After the return of the battery to England, Her Majesty Queen Victoria was graciously pleased to inspect the flag at Windsor.

On the east side of the fort, the Boers had started to run a sap early in the siege, out towards the magazine (which had been vacated by the defenders, the ammunition having been removed to the fort). The magazine was connected to the fort by a straight, not a zig-zag, sap. Parallel to this, ran that of the enemy, whose intention was clearly to head the magazine. After getting ahead of it, and then bringing this building in a line between themselves and the defenders, the Boers would be safe from the fire of the 9 pr. guns, at any rate until the magazine was demolished by the British. Actually, after Lieut. Lindsell's night attack on the sap on the 5th January, the direction was changed to head the magazine, and when this was done, the Boers occupied trenches round three sides of the defenders' position, whilst on the fourth side, the houses on the outskirts of the town gave them shelter. When the sap was only 65 yards from the magazine, the attackers constructed an earthwork for a ship's gun they had brought up and which gave them command of fire into the fort. This sap was executed with the greatest cunning. After the attack on it by Lieut.

[1] From "The Siege of Potchefstroom"; by Lieut. H. M. L. Rundle. ("Proceedings R.A.I." Vol. XII. No. 1, and also Colonel Winsloe's account.

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Lindsell's party, the Boers doubled it, so as to have one trench covering the other, the second trench, however, was constructed out of sight of the British garrison, as the main sap works sheltered it from view.

By the end of January, 1881, food had run very short and the garrison were now placed on quarter rations. From March 1st, only Kaffir corn and mealies were available, all meat, tea, coffee, sugar and biscuit being finished. The mealies were crushed to a meal, and cooked and eaten in the form of porridge. Disease had set in, and dysentery, fever and scurvy were prevalent. On the 20th March, there being only four sacks of half-rotten mealies left in the way of food, Colonel Winsloe called together his officers for a conference, and it was decided as most expedient to surrender at once with honourable terms, rather than to be forced to do so unconditionally three days later. No news had reached the garrison of any armistice, or hope of any relief column, and the wagon with the eight days' supplies of food sent from Natal had never arrived.

On the 21st March (the following day) it was decided, subject to the Boers accepting the terms, to surrender with all the honours of war. The proposals were agreed to by the Boer Commandant, and three months and five days after the commencement of the investment, the garrison capitulated. All personal property, and ammunition, was allowed to be retained, but guns and rifles had to be given up. On the 24th March, the garrison started on its march to Natal via the Orange Free State.

The British casualties during the siege of Potchefstroom amounted to :—

Killed or died of wounds—1 officer, 24 other ranks.
Died from disease—4 other ranks, 2 civilians.
Wounded—5 officers, 47 other ranks, 2 civilians.
Total—83 out of 213, or nearly 40% of the whole.

The casualties in N/5 R.A. were :—

Killed— Sergt. Kelvington.
Drivers Umsworth, Crannie, Bennett, Green, Walsh.
Gunner Larkin.

Wounded—Lieut. Rundle and 10 other ranks.

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As instances of the severe nature of the attack, it may be noted that one tent in the fort was discovered to have 300 bullet holes in its upper portion, at the end of the siege, and the two 9 pr. guns had hardly a single spoke in any wheel of guns or limber not struck by a bullet.

In connection with the siege of Potchefstroom, the following District Order was issued.

DISTRICT ORDER.

Pretoria,
7th April, 1881.

The fort at Potchefstroom capitulated on 21st March, but only when its garrison was reduced to extremity, and after as brave a defence as any in military annals, the troops marching out with all the honours of war, and proceeding through the Orange Free State to Natal.

The sterling qualities for which the British soldier has been so renowned have been brilliantly shown in this instance, during a long period of privation, and under very trying circumstances.

Colonel Bellairs begs that Lieut.-Col. Winsloe and the officers and men under him will accept his thanks for the thorough and determined way in which they have performed their duty.

(Signed) (B.O.) M. CHURCHILL,
Capt., D.A.A.G.

XIII.

CONCLUDING EVENTS OF THE CAMPAIGN, AND WITHDRAWAL OF THE BRITISH GARRISONS.

The terms of peace had hardly been settled and confirmed, when the British reinforcements promised after Majuba began to arrive and disembark,[1] and Major-General Sir E. Wood and his Staff commenced to organize the Field Force (provisional). The further despatch of troops was, however, now stopped. Sir O. Lanyon left Pretoria on 8th April, and the return of all the British

[1] Including A/1 Field Battery R.A. (now 9th Field Battery, R.A.), arrived Durban, March, 1881.

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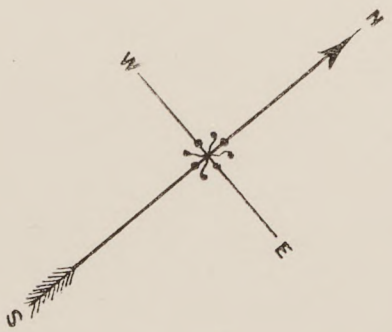
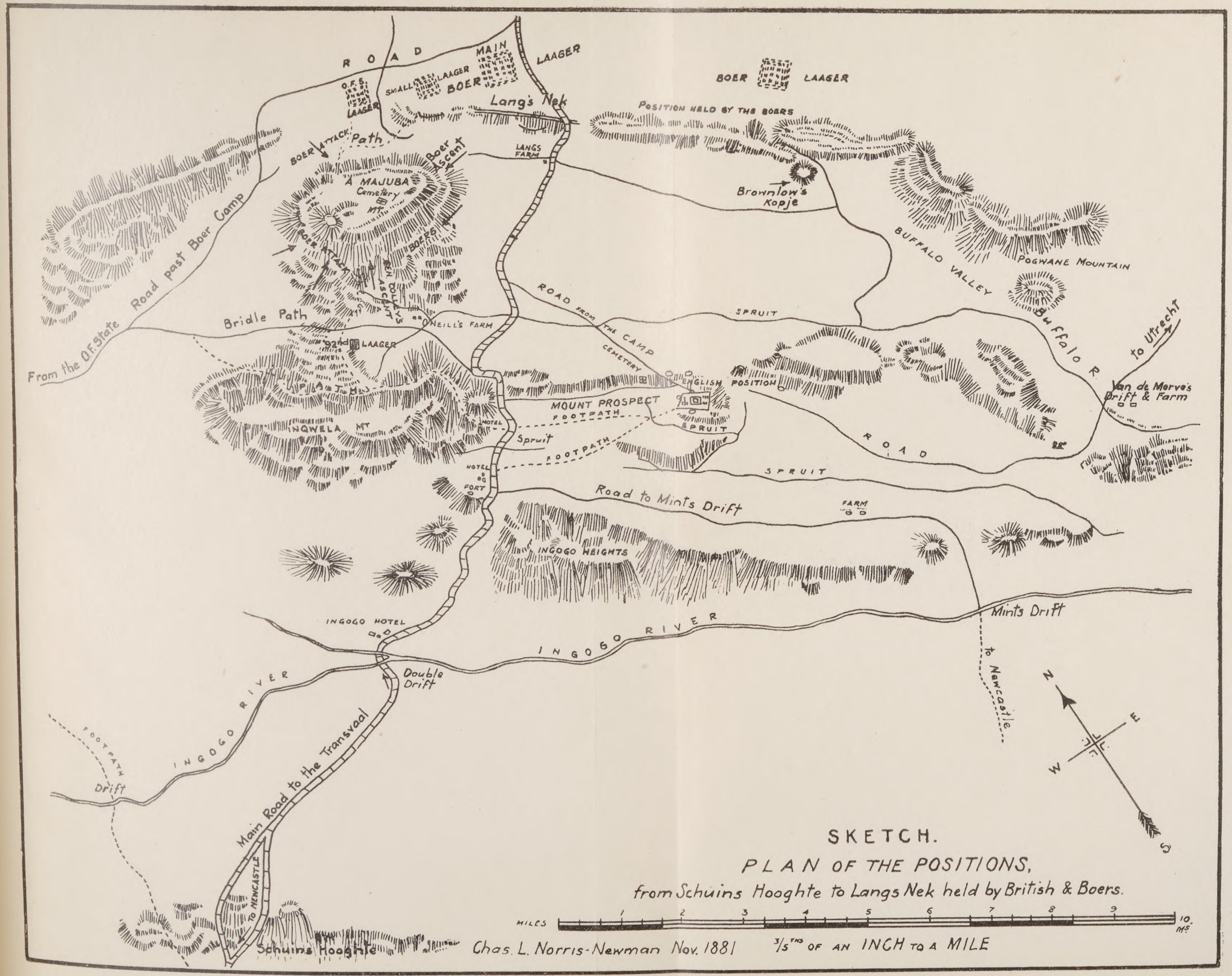
PLAN OF
the
A Majuba Top, 6200 Ft above the Sea

DRAWN TO SCALE FROM ACTUAL MEASUREMENT BY

Chas. L. Norris-Newman.

Total Area, about 4¾ acres.




ROAD
MAIN
LAAGER
O.F.S. LAAGER
SMALL LAAGER
BOER
Lang's Nek
BOER LAAGER
POSITION HELD BY THE BOERS
BOER ATTACK
Path
Boer Ascent
LANGS FARM
A MAJUBA
Cemetery
Mt
Brownlow's Kopje
BOERS
BOER ATTACK
BEN COLLEY'S ASCENT
BUFFALO VALLEY
POGWANE MOUNTAIN
From the O.F. State Road past Boer Camp
Bridle Path
NEILL'S FARM
ROAD FROM THE CAMP
SPRUIT
Buffalo R.
to Utrecht
92nd LAAGER
CEMETERY
ENGLISH POSITION
Van de Merve's Drift & Farm
PATH
MOUNT PROSPECT
FOOTPATH
INQWELA MT
HOTEL
Spruit
FOOTPATH
SPRUIT
ROAD
HOTEL
FORT
SPRUIT
Road to Mints Drift
FARM
INGOGO HEIGHTS
Mints Drift
INGOGO HOTEL
INGOGO RIVER
Double Drift
to Newcastle
INGOGO RIVER
FOOTPATH
Drift
Main Road to the Transvaal
TO NEWCASTLE
Schuins Hooghte
N
E
W
S
SKETCH.
PLAN OF THE POSITIONS,
from Schuins Hooghte to Langs Nek held by British & Boers.
MILES 1 2 3 4 5 6 7 8 9 10 MS.
Chas. L. Norris-Newman Nov. 1881
3/5THS OF AN INCH TO A MILE

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prisoners of war and wounded was proceeded with as rapidly as possible. General Sir E. Wood paid a flying visit to Pretoria, arriving the second week in April, and congratulated the garrison on their conduct during the siege, and on the able manner in which they had carried out the defence. The Royal Commission was now at work, and the evacuation of the British garrisons proceeded with.

The transfer of government was carried out on 8th August, and finally on the 18th November, the last British troops left the country. These were the 2/21st Royal Scots Fusiliers and the Section of N/5, Royal Artillery, from Pretoria, the latter rejoining battery H.Q. in Natal. A field force of 12,000 was retained in Natal, until all was settled and it became clear that the Boers intended to abide by the terms of the settlement.

In a campaign conducted under such disadvantageous conditions, and entailing so many "regrettable incidents" and disasters to our forces, in some of which the conduct of our troops has been somewhat freely criticized or commented upon, it is gratifying to recall, that in no single instance did the Royal Artillery engaged acquit themselves otherwise than with the greatest credit, and often under the most trying circumstances.

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NOTES ON ARMY ADMINISTRATION AND EDUCATION OF OFFICERS THEREIN.

By Brigadier F. D. Logan, c.m.g., d.s.o.

THE title of this article will, it is feared, arouse little enthusiasm in the mind of even the most ardent military student. It conjures up none of the glamour of the panoply of war, but merely visions of masses of correspondence, volumes of regulations, vouchers, returns, certificates, financial and other observations, and vast quantities of red tape. No excuse, however, is offered for discussing this subject because Administration, with its many ramifications, affects every officer and man intimately from the time he joins the army until the day he leaves, and curiously enough it is a subject in which officers usually get very little instruction outside their own unit.

Efforts have, it is true, been made in the past to remedy this, as for example the establishment of the School of Administration at Chisledon, but the strokes of the economy axe soon brought them to an end. The result is that the broader principles of Administration are usually not thoroughly appreciated. Especially is this true with regard to matters involving finance. Now unless all officers have a knowledge of these principles, and of the effect of the system of financial control with the reasons for its existence, the military machine can hardly be expected to run without a great deal of waste of time and energy, and the "stationary barrage" is liable to assume needless proportions. Moreover, if officers understand the system of financial control, they are more likely to appreciate why certain orders are issued, or why certain action is taken, which to the uninitiated seems mere foolishness. They will not then be so much inclined to look upon these orders, etc., as the product of the perverted brain of some super-Hun sitting on an office stool who, with a vast amount of leisure at his disposal, has to fill in his time somehow in order to justify his existence. Further if a man is not guided to look at questions from the larger point of view, he is liable to become so much absorbed in his own immediate surroundings that he is apt to lose

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a proper sense of proportion and cannot appreciate how his actions react on and affect other units, or how differently his own apparently simple requests appear when considered from the point of view of the army as a whole.

It is not possible within the scope of a brief article to deal comprehensively with so large a subject. It is proposed, therefore, first to draw attention to the essential principles of administration, then to describe briefly the system of financial control, and finally to wind up with a few suggestions to young officers to enable them to improve their knowledge without undue waste of opportunities.

There is a trite expression often applied from time to time to some distinguished man, who is called "the most successful administrator since Moses." Moses is presumably considered the pattern of what an administrator should be. It is not desired to belittle Moses' capacity, but the fact cannot be overlooked that he had no knowledge of the first principles of administration until his father-in-law, Jethro (who incidentally never seems to be given any credit for his instruction) "put him wise" on the point. In the Book of Exodus it is recorded that Jethro went up to stay with Moses after the Israelites had left Egypt, and the day after his arrival he was surprised to find Moses spending the whole day at his office, trying to deal personally with all the various matters referred to him by the people. Moses was, in fact, trying to do everything himself, and the people were kept waiting about all day "from morning until the evening"; and they were complaining bitterly about it. Jethro told Moses that his methods were not good. He told him that he ought to "provide out of all the people able men, such as fear God, men of truth, hating covetousness" (i.e. not likely to be open to bribes which, presumably, was an eastern trait even in those days) "and place such over the people to be rulers of thousands, rulers of hundreds, rulers of fifties, and rulers of tens." These were to do all the ordinary work, the small matters, referring only the important questions to Moses. In other words Jethro taught Moses Decentralization. History does not relate, but no doubt Moses' successors found out, when they reached the Promised Land, that while Jethro's advice was excellent at the time, it did not quite hit the nail on the head when they had settled down. What they then wanted was not merely rulers of thousands, rulers

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of hundreds, etc., but rulers of areas, rulers of sub-areas, rulers of sub-sub-areas, and so on. For this is where decentralization for administration differs from decentralization for command and training. The basis of administration is an area, of command, etc., a unit or formation. So to-day the War Office administers the army by decentralizing all except the vital matters to commands, commands to areas, and areas to stations, and on this is grafted the organization for war, i.e., formations.

This principle of decentralization must be applied intelligently. There is a limit to the number of subordinate headquarters with which a superior headquarters can deal direct and at the same time exercise efficient control. Six is about the maximum, and when this number is exceeded, intermediate groups must be formed, just as in the war divisions were at first grouped into corps, which had later to be grouped into armies. This point is emphasized because, obvious though it may be, it is apt to be overlooked when the need arises, with resultant troubles. For instance, in the war, at the beginning, bases were established on the lines of communication, each with its own headquarters and staff. Comparatively small at first, as the war progressed, each base developed enormously. New installations, labour companies, transportation units, workshops, depots, ammunition dumps, etc., swelled their numbers and in many cases they became far too big for one headquarters to control efficiently without the establishment of intermediate sub-area headquarters. Calais base, for example, had grown by the time of the armistice into an area about 400 square miles in extent. The personnel in the area numbered approximately 100,000 or nearly equivalent to that of two corps. Large numbers of the men had no proper military training. Most of their officers, having been selected for their technical qualifications, were unaccustomed to looking after men outside working hours. It was essentially a situation where effective control was vitally necessary, but such control was impossible because area headquarters had to deal with too many sub-areas and units. This lack of the means of effective control was severely felt during the troublous period just after the armistice. Had a reasonable decentralized system been possible, matters would never have reached the pitch they did.

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Decentralization and control are not alone sufficient for efficient administration. There must also be co-operation between all the numerous branches. This is a well-worn platitude, but it is a platitude which in practice is frequently forgotten. Especially in cases where a unit belonging to one formation is accommodated in the area administered by another; or in the dealings of technical services, who always have to serve two masters, viz. their own technical superior in matters of a purely technical nature, and the station or area commander in other matters. Indeed it is in respect of the technical services that this lack of co-operation is most likely to occur, because the dividing line between technical and non-technical subjects is not always clearly defined and issues of a non-technical nature, such as discipline, may soon arise out of a subject which originally seemed purely technical.

Space does not permit of giving many examples. A simple one will suffice. There are several people who have certain responsibilities in connection with the care of barracks. The Royal Engineers look after the fabric; the barrack department is responsible for providing the equipment; the medical authorities watch the sanitation; and the buildings are on the actual charge of the O.C. unit in occupation. Unless these authorities keep in close touch with each other in any of their dealings with the barracks, sooner or later confusion is bound to occur. Every officer, indeed, should be so trained in peace time that whenever he issues any order, obtains any information, or contemplates any action, he should ask himself this question: "Who else ought to know this or is affected by this?" If this is always done, many awkward situations will be avoided. Decentralization, control, and co-operation are then the main essentials for efficient administration. Incidentally they are just as essential in training, but training is outside the scope of this article.

These principles have so far been discussed from the general point of view, but they apply equally in the case of a unit. A commanding officer has many onerous duties and responsibilities laid upon him. Amongst the various regulations will be found many paragraphs defining the responsibility of a C.O. Paragraphs 70 to 80, King's Regulations, are comprehensive enough, but there are others in greater detail throughout the

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book and in other Regulations. Indeed the collation of all these paragraphs into one pamphlet would involve a lot of labour, but it would be labour well spent. If a C.O. unmindful of Moses, tries to do everything himself and does not fully appreciate the principle of decentralization, he is lost. His only hope is the intelligent application of the above principles. He should exercise control by delegating certain of his duties to his subordinates by a standing order, with instructions that they furnish him with periodical reports. For example, a C.O. is responsible for his mobilization stores. A complete check of these stores is a lengthy business and cannot be undertaken frequently without considerable interference with other duties. But if a standing order is given that a specified officer will inspect them, say weekly, and will on each occasion count one or two items taken at random, recording the result in a book kept for the purpose, it will not be an easy matter for an evil disposed person to make away with any of the stores without a reasonable chance of early detection. The mere knowledge that such a system is in force will in itself be a deterrent, and, moreover, if any stores should disappear, the fact that the C.O. has a well-organized scheme of inspection will be of considerable weight in any subsequent enquiry and application for a write-off. In addition to decentralization, if all ranks can be inspired with a spirit of loyal co-operation, as is seen in the best units, the C.O. can face his many responsibilities with perfect equanimity.

One obvious criticism by those who have managed to read the foregoing remarks will be "It is all very well to insist on the advantages of decentralization, but there is not much decentralization where finance is concerned. If a unit loses, say, a couple of signalling flags or a pickaxe, the C.O. has to get the authority of command headquarters to write them off. Why should he not be allowed to write them off himself?" This criticism is perfectly reasonable, but here is involved a constitutional matter, the system of finanacial control. For the benefit of those who have not studied it a brief description will not be out of place.

When the Revolution took place in England in 1688 and William of Orange came over to be King, Parliament had recently seen the army become the paramount authority and usurp the

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powers of the representatives of the people. They were determined to ensure that such a situation should not happen again. They therefore passed a law that no standing army should be maintained in time of peace without their consent, and that Parliament alone should control the purse strings. Charles II had used money granted for the army in entertaining his mistresses. The Duke of Marlborough had pocketed what he asserted was the usual percentage on the bread contract for the army. Parliament therefore laid it down as a cardinal principal that money voted for any one service was not to be spent on any other service, and they set up safeguards to ensure that this law was obeyed. First, they appointed an official called the comptroller and auditor-general of public accounts (Comptroller of the Exchequer and Auditor-General would be his full title). His department is known as the exchequer and audit department. He is independent of the executive government and is *personally* responsible to Parliament for auditing all public expenditure. He furnishes an annual report to Parliament which is gone into by a committee appointed by the House of Commons. Secondly, in every public spending department one of the permanent officials is appointed accounting officer for that department by the Treasury. The accounting officer is held *personally* responsible to Parliament that expenditure in his department is made in accordance with the regulations, and he must be ready to answer any observations the auditor-general may make on the accounts of his department before the House of Commons Committee mentioned above.

The accounting officer for the War Department is, as is recorded in the Army List, the Permanent Under-Secretary of State for War, the Secretary of the Army Council. To enable him to watch the expenditure of the war department he has a civilian staff at the War Office, viz.: the finance branch. He has also representatives at the headquarters of the principal commands to watch the situation there on his behalf, namely the local auditor (who has no connection with the exchequer and audit branch) and the command paymaster. These two have to answer to the accounting officer if they pass or make any payments which are not in accordance with the regulations. The Army Council, in their turn, have their own responsibilities to con-

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sider. In all the principal commands there is an officer in charge of administration whose rank varies with the importance of the command, and whose duties are to relieve the G.O.C. of administrative work, except in matters involving policy or principle. The Army Council hold the officer in charge of administration responsible on their behalf:—

1. That the money voted by Parliament is not expended without due authority under the rules laid down by Parliament and the treasury.
2. That the money voted is not used for any purposes other than those contemplated by Parliament.
3. That the sums allocated to him under the various sub-heads of the votes are not deliberately exceeded.
4. That losses and unremunerative expenditure generally are not written off contrary to the regulations. (See King's Regulations, para. 124.)

To assist the officer in charge of administration in his task he has as financial advisers the command paymaster and the local auditor. The former advises on all questions of pay and allowances and on any other financial matters which may be referred to him. If the command paymaster disagrees with any ruling, which affects finance, of the officer in charge of administration, the latter has to refer the case to the War Office, and the command paymaster has to report to the accounting officer. The local auditor audits the cash, messing, supply and store accounts, and carries out local inspections of accounts and stocktaking. He is available to give independent financial advice to the officer i/c administration, if required, and his concurrence must be obtained in all cases where it is so laid down in the regulations in regard to writes-off. (See paras. 126-128 and Appendix IV, King's Regulations.) In certain commands the local auditor is also appointed financial adviser, e.g. Egypt, the Rhine and the S. China commands. His duties are then more extended than those of a local auditor. Briefly a local auditor is available if requested, to give financial advice to the G.O.C. through the officer i/c administration; as financial adviser he can advise the principal staff officers and heads of services.

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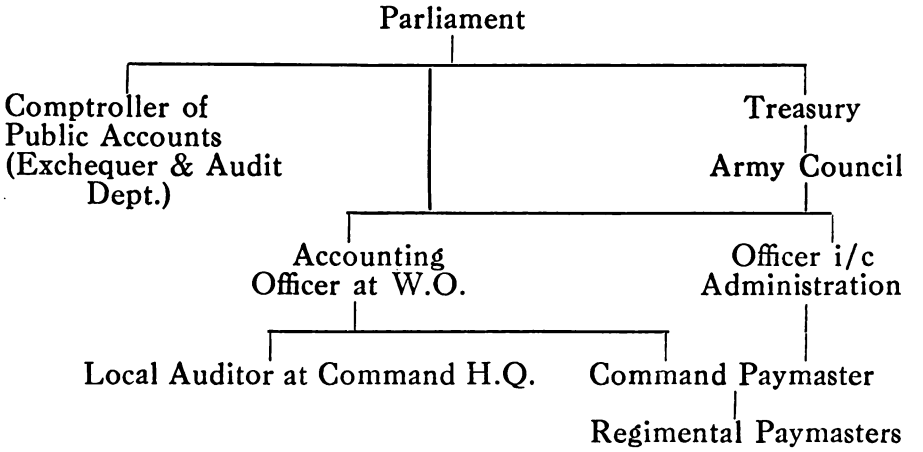
The financial chain of control may be diagrammatically shown as follows :—



It will thus be seen that Parliament has two independent watchdogs over army expenditure.

1. The Comptroller and Auditor-General.
2. The Accounting Officer.

The Comptroller and Auditor-General has local examiners permanently at the War Office and in certain commands. The Accounting officer has two watchdogs in each big command.

1. The Local Auditor,
2. The Command Paymaster,

and the Army Council has

1. The Officer i/c Administration.
2. The Command Paymaster.

The command paymaster, it will be noted, is in the unenviable position of having to serve two masters. The exchequer and audit acts as a check on the local audit branch. The local audit branch acts as a check on the command paymaster and the military authorities, and the command paymaster acts as a check on the military authorities. There is no need here for the question "Quis custodiet ipsos custodes?" With all these custodians on watch the number of queries and observations which are made in matters where finance is concerned can hardly be considered surprising. Each watchdog is bound to see that no financial payment is made,

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and that no action involving finance is taken, which is contrary to the regulations. Hence the demand for the numerous certificates to be signed by officers in their various claims for allowances, etc., for the requests for fuller explanations in applications for writes-off, etc., and for the many observations on accounts. If officers would always remember the shadows in the background of the Auditor-General and the Accounting Officer, and the personal responsibilities laid upon them by Parliament, financial observations, queries, and memoranda would probably be received with less disfavour and with greater tolerance than is usually the case. They would also thoroughly appreciate the necessity in any applications for avoiding vagueness and ambiguity and for giving full and explicit details. It is the failure to realize these responsibilities that causes much waste of time and paper.

Can this financial authority be decentralized further to an area headquarters? Such a step would necessitate either pay and audit staffs, with delegated authority from the command paymaster or local auditor, at area H.Q. or the area commander would have to be empowered to deal direct with the command paymaster and local auditor in settling financial problems. Apart from any statutory objection, increase in staffs and accommodation would be barred in any case by the extra cost. The latter alternative is the only feasible proposition. Its adoption would, however, be no gain either in time or correspondence, but quite the reverse, since files would have to be sent to and fro, by post; neither would there be the opportunity for personal discussions of intricate problems which are more likely to produce good results than any amount of writing. Further decentralisation would, moreover, make the situation more difficult for the accounting officer.

It now remains to discuss, as threatened in the introduction, the methods by which a young officer can acquire a sound knowledge of administration without an unprofitable waste of time and effort. The responsibility of a C.O. with regard to the instruction of his officers (78 & 79, K.R.) is an extremely serious duty, since on its efficiency will largely depend the progress of his officers in their profession. Many C.O's of course, know how to deal adequately with the problem. It is for those less fortunately situated that the following suggestions are made.

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A young officer on joining is usually handed various books of regulations with probably a mass of amendments in bulk. Apart from the training manuals, the most important are the King's Regulations and the Manual of Military Law. The idea of tackling unamended copies of these volumes is apt to quench his ardour. Guidance from above is obviously needed. A regular course of progressive personal instruction in a unit is not always possible with the numerous demands made on an officer's time by courses, musketry, attachments, etc. Much will therefore have to be done by the individual in his own time. His task will be greatly facilitated by a definite syllabus with notes for his guidance. Taking King's Regulations, amended to date, the first step is to study the lay-out, i.e. the arrangement of the sections in the table of contents. The paragraphs can be divided into three categories, viz.: (A) Those which must be known thoroughly; (B) Those which must be read carefully; (C) The remainder which can be skipped. This subdivision into categories should be detailed in the notes issued for guidance. In category (A) some of the paragraphs should be starred as of special importance, such as para. 1187, regarding responsibility for public money, etc. The failure to comply rigidly with the instructions of this para., especially sub-para. (e), (subjecting other ranks to the risk of loss) has probably caused more trouble and distress than in the case of any other regulation. The introductory order on page (iii) must not be omitted, especially the third sub-para. Where it is not possible for the reasons stated above to allot a short time each week for verbal instruction, groups of test questions on the different sections should be issued. The initial labour spent in preparing them would be amply repaid in the future.

The Manual of Military Law will be a little more difficult, especially until a revised manual is published.[1] The lay-out of the Army Act as given in the table of contents in the middle of the book, should be studied. Valuable help will also be obtained from such books as Banning's Military Law, and from the War Office letters sent out usually every six months detailing the errors which have recently occurred. Test papers should also be issued as in the case of King's Regulations.

The Royal Warrant for Pay will not take up much time.

[1] The 1929 edition is now out.

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Every officer should know the articles laying down how much a soldier may be stopped for messing and washing and the limitations imposed as to stoppages, also Article 8. (Note that the paragraphs are called "Articles") [1]

"Mere prattle without practice" must not, however, be "all his soldiership." Besides book study, every opportunity should be taken of giving young officers practical instruction in the orderly room, in quartermaster's duties, in transport duties, etc. (K.R. 86). In the orderly room more requires to be done than mere dealing with the correspondence. If the officer under instruction has already thoroughly assimilated Section XIII, K.R., he will have no difficulty in putting into effect the instructions given therein. Points which are apt to be overlooked should be emphasized, such as the necessity for always recording an opinion or recommendation, for answering reminders by return, for avoiding like the plague such minutes as "The attached is forwarded for decision" without any precis or summary or even an opinion, and for seeing that all official letters are opened by an officer. In the quartermaster's office he should be taught the correct way to enter up vouchers in ledgers, why it is necessary to call stores by their correct names, how to check stores, etc. Much useful help will be found in a small book "Some pitfalls of Army Accounts," by Captain Parker, R.A. The point is that attachment for duty must be supplemented by real instruction.

Lastly every officer should be taught to be always looking ahead. Bacon in one of his essays wrote that a man should divide his knowledge between his memory and his notebooks. This is sound advice. Every officer who wishes to get on should keep notebooks (reference books perhaps would be a better term), and should enter in them important points in the different subjects as he studies them. The mere fact of recording them will help him to impress them on his mind. The notes should, of course, be arranged methodically so as to facilitate reference. It means a bit of bother, but it will save a lot of time and trouble later on. Promotion examinations can then be tackled without the hasty and

[1] There is a lot of valuable information to be found on the organization, both past and present, and on the administrative system of the Military Forces in the "Army Estimates," published annually; price usually 6/-, a most useful book for the military student.

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intensive preparation which sometimes has to be undertaken just before they take place. If an officer aspires to become adjutant or C.O. or to go up for the Staff College, a large book of reference will be found a great help. In this should be recorded methodically hints, or tips, which are likely to be of use in the future, for example :—with regard to training, move of a unit by rail and by sea, camps, taking over barracks, inspections, messing, mobilization, lectures, etc., etc. From time to time instances will be met with where serious trouble is caused through someone overlooking some particular regulation. The pitfall should be noted so that in like circumstances in the future a similar error may be avoided. Decisions on important matters of general and permanent interest can also be usefully recorded. In time this volume will become a valuable aide-memoire and book of reference, and a great help in giving instruction to others. Instruction, especially on dry subjects, is always made more interesting by the aid of apposite anecdotes or episodes. For example, about forty-five years ago the *Sporting Times* described a reconnaissance report supposed to have been made by an officer on a certain road. The officer was required to include in his report details as to the accommodation available, the supplies obtainable, and the inhabitants. The result, which could be quoted to a class of instruction in administrative reconnaissance as an instance of how it should *not* be done, was as follows :—

"*Road report from X to Y.*

Royal Oak Inn.—Beer 2d. a glass. Pretty barmaid.
Road to "Three Sailors Inn" straight and level.
Three Sailors Inn.—Whiskey 3/- a bottle, good. Sun hot. Inhabitants friendly. Accommodation not known as the landlady would not allow the barmaid to show me the bedrooms.
Road to "Plough Inn" rather wobbly and up and down.
Plough Inn.—Very old beer at 4d. a glass.
Road to "Pig & Whistle" hilly and curly.
Pig & Whistle.—Inferior brandy. 6d. a small glass. Inhabitants unfriendly.
Road after this mountainous and circular, also revolving."

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The above suggestions are very brief and incomplete. (The education of an officer would as a subject for discussion alone require many pages.) There are, probably, few to whom they will be of any value, but if only a few derive some benefit from them, the object of this article will be achieved. Summarizing, they are :—

(i) Progressive study, on a methodical plan.
(ii) A sensible use of notebooks, with an eye to the future.
(iii) Guidance from competent officers.
(iv) Practical attachments for instruction.

The first two are within every officer's power, the last two require outside assistance. If so placed that such help is not readily available in his unit, the student should never hesitate to ask for aid from an experienced staff officer, remembering that "beneath many a hat of brass there often beats a heart of gold." He may eventually reap the reward of his labour by having his name emblazoned on the scroll of Fame, with Moses quoted only as an "also ran" !

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THE ROMANCE OF THE FIRST AFGHAN WAR.

By Lieut.-General Sir George MacMunn, K.C.B., K.C.S.I., D.S.O.,
Colonel Commandant, R.A.

I AM not quite sure if I am making the word "Romance" do its proper duty in this connection, but what I want to put forward is the human side of this prolonged war when English men and women too were as familiar with Kabul and the long road thereto as they are with Peshawar to-day, when nurses and children and ayahs and pianos found their way up the Khyber, at a time when there was not a mile of railway in the whole of India. It was a time when young officers rode from Kabul to Ghuzni for the races without escort and stayed hawking and shooting with Afghan Sirdars all over the countryside, and all was calm for a while as in an Indian Cantonment to-day.

There are few campaigns that have been so loosely written about as that from 1839 to 1842, or perhaps so unfairly represented to posterity. It is the human side therefore that I want to develop, and to see in these days when folks escape from Kabul by aeroplane, how it really was ninety years ago.

First of all it is well to remember that it was not a war at all to begin with. The exiled king, believed to have a big following in his own country, was to be replaced on the throne by his own troops raised in northern India from any sort of mercenary. Once before had he raised troops in India and had beaten Afghans with them, and this time they were to be raised and commanded by British officers rather than by Eurasians. The British force was to go in support of this force and was but expected to make a promenade. The British Envoy, Mr. Macnaghten, was the principal British representative.

It will be remembered that the plan to put the exiled shah Shujah ul Mulk on the throne of his fathers was in pursuance of the famous Tripartite Treaty by which the Governor-General Lord Auckland, Runjhit Singh of Lahore and the Shah himself engaged to enter into a friendly alliance which was to put an end once and for all to the quarrels and invasions of Sikh and Afghan.

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The great Camp at Ferozepore.

In 1838 the Sikh frontier was on the Sutlej, and then as now, on the hither side of the Indus were the Protected Sikh States, those of Sikh chiefs whom we had protected from being absorbed by the all-compelling young adventurer Runjhit Singh, who was now the mighty though dying Maharajah of the Punjab. Ferozepore was a town and there was no cantonment, but as a place where the main road from Delhi to Lahore crossed the Indus, it was obviously the point where the allies should assemble. During the winter of 1838-9 there was collected a great durbar camp, similar in many ways to those we have seen at Delhi in modern times, and organized as only India can. To the camp on the banks of the Sutlej came the Governor-General himself and all the foreign and political department, the Commander-in-Chief, General Sir Henry Fane, and two Bengal divisions commanded by Major-General Sir Willoughby Cotton, and Major-General Duncan respectively, consisting of three brigades of three battalions each. To the camp also came the Shah specially set up with the kingly trappings that had been despoiled from him, and with him was his own half-trained contingent which had been got together at Ludhiana. Those who are familiar with "From Sepoy to Subadar" will remember that Sitaram took special promotion from his own Bengal regiment into this force which consisted of six battalions, a cavalry regiment and a battery of horse artillery. The men were Hindustanis, then the essential backbone of any force in Northern India, Punjabis and a Gurkha regiment. Gurkhas had long flocked to military service with the Sikhs and were always on tap, indeed the Punjab Frontier Force had a Gurkha regiment because of this fact, the 5th Gurkhas being originally raised from the Nepaulese in the disbanded Sikh army in 1849 . Officers and N.C.O's, British and Indian, were volunteers from the Bengal Army.

On the other side of the Indus was assembled a Sikh army in suspicious friendliness, and the Maharajah himself.

The artillery with the force was chiefly Bengal Horse Artillery. The whole force was in blue and scarlet and in Afghanistan the officers wore the blue frock coat and sash, with forage cap. The horse artillery wore throughout the campaign their brass dragoon

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helmets of the old British dragoon pattern, with leopard skin roll round their dress jackets with white leather breeches and high knee-boots. In the Bengal Horse Artillery was one native brigade, of which the Indian rank and file wore a high cap of Persian lamb-skin, as did also the Shah's horse artillery. There is a coloured engraving sometimes to be seen of this troop crossing a stream.

In those days there was no mountain artillery, though a mountain train existed in Kandeish manned by a company of Bombay native artillery and there were train equipments in the arsenals but nothing of a cult as grew up later. The horse artillery took its place and the artillery with this force was almost entirely of that nature. A heavy battery was taken to deal with the walls of Kandahar and Ghuzni, but its cattle were so weakened in the march, the badly managed march, through Baluchistan, that they never went beyond the former city.

Major George Brooke, afterwards Major-General Sir George Brooke, who accompanied the force in the horse artillery, wrote a most interesting diary which appeared some forty years ago in the "Proceedings." He tells of the doings of the Tamasha at Ferozepore, and the reviews and durbars, Runjhit Singh inspecting the British forces and the Governor-General the Sikh army. Brooke, the typical hard-bitten gunner, stands aloof from all "piaffing" and writes somewhat scornfully of the goings on. His account of the Sikh army and its somewhat mysterious European officer cadre—part adventurer part ex-officer—is worth recording, and in reading of Mr. Fowle we may recall the figure of Jim Douglas, the leading character in Mrs. Steele's book "*On the Face of the Waters.*"

"The officers, horse and foot, in gaudy cavalry-pattern jackets, of red and gold *à la* Hussar. Some few blue and red, acorn-embossed collar and cuff and epaulettes. Some of the foot gold, some silver epaulettes on Hussar jackets; lower gear nothing could be worse, no uniformity no pattern . . . . among the officers saw two Europeans. One an American in an Artillery commissary staff lace blue jacket, and sort of forage cap: untidy, dirty, and vulgar looking. The other dressed in the rough nature as a horse-man: very tidy well mounted neat and looking very smart and soldierlike. He evidently was incog. and wished to remain so.

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Ford was in camp but invisible, he commands a corps of cavalry not much in repute for ability. A Mr. Fowle brother of a lawyer in Calcutta was recognized by A. Abott as a school-fellow, and (said) to have disappeared from his relatives, was recognized at the head of a regiment of cavalry: a gentlemanly man in manners and appearance, had a soldier's cut about him in dress and pattern; is very well informed. He was asked to dine at our mess. Some of our officers went to visit him; his camp equippage was in our style; he seems to have laid out his course in the event of Runjhit Singh's death."

With reference to this last remark it may be recorded that after the event referred to which occurred soon after, several of the European officers were murdered by the Sikh troops.

Brooke has an amusing story of Runjhit Singh demanding that the artillery commander (Colonel Graham) should shoot a nine-pounder at a mark against the Sikh chief artilleryman, and how Graham, pleading aged eyesight, deputed one Major Pew to take his place. The contest fell through at the last moment after Pew had paraded for the event. Brooke describes the French words of command and the drums beating in French style. The Sikh troops were largely trained by French officers, practically the last French trace in India of the old influence. In the Jammu and Kashmir Army which was the direct surviving child of Runjhit Singh's army so late as 1894 when the writer was training artillery in Kashmir, the old officers could drill in French—a French drill of a pre-Napoleonic period.

The March to Kabul.

It was originally hoped to cross the Punjab and, together with some Sikh troops, march to Kabul by the Khyber. But Runjhit Singh would not agree, and as part of our object was to succour Herat, then beleaguered by the Persians, it was decided to make the astoundingly roundabout route of Sukkur and Kandahar, wandering down the Sutlej and the Panjnad (the combined bulk of the Five Rivers) to its junction with the Indus and then down the Indus to the point of crossing. Before the force left Peshawar, however, the Persians had retired from Herat and the 2nd Bengal Division was left behind at Ferozepore. In re Herat the name of Eldred Pottinger, the Bombay gunner subaltern traveller, who

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by chance joined the defence and proceeded to galvanize it, is well remembered. In the Persian camp was another gunner of fame, one d'Arcy Tod, of the Bengal Artillery, on special duty with the Persian army. He was later killed in command of a troop of horse artillery at the battle of Moodkee.

Helped by the waters of the rivers and the boat transport as well as the efficient flotilla of the Indian Navy now growing up on the Indus and its tributaries, the force wandered down to Sukker-Bhukker, where it eventually met Sir John Keane and the Bombay division. When the force for Afghanistan was reduced, Sir Harry Fane was no longer to command the expedition and he left them at Sukker, where Sir John Keane the Commander-in-Chief in Bombay took command. Some trouble with the Amirs of Sind having been overcome the force crawled painfully over the now red-hot desert of Kach Gundava and painfully through Baluchistan, preyed on by robber tribes and at the mercy of a very amateur staff and a commissariat quite unprepared for the unaccustomed conditions of a barren country.

As soon as the wild upland tracts of Baluchistan were passed, the force, led by the Shah's Contingent, entered the fertile lower levels near Kandahar and came into a land of comparative plenty. The starving beasts got fodder and the men atta and meat. The contract system and the bunya began to work once more and the army forgot its troubles and its ignorance of how to get six-to-four the better of the marauding tribesmen. The army, however, had no-one to thank but themselves for all their supply troubles. The scale of baggage was atrocious. A subaltern of the 16th Lancers writing home describes a blizzard and how owing to the fact that his tent was a small one his seventeen followers were able to keep it from being blown down! This number no doubt included syces and grass-cuts for three chargers, bhisti and tent lascars as well as personal servants. No wonder the followers ate up the land like a flight of locusts, and straggling on the line of march were cut up by tribesmen. Your Indian follower is always incorrigible at wandering into stray hovels in search of loot which he will carry about as part of your baggage for weeks if not searched. The troops suffered a good deal from a surfeit of fruit in which Kandahar abounds and it was some weeks before

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Sir John Keane was ready to move on. The British Envoy, who as it was not yet a war, controlled matters, was anxious to proceed with a very small force besides the contingent, on the 300 mile road to Kabul, but this the soldierly instinct of the Chief could not brook. He insisted on marching with the bulk of his troops, but the siege cattle were too "done in" even after some weeks halt to drag the 18 prs. up to Ghuzni, the long road that rose three thousand feet in the process, and Ghuzni was still before them with only 9 prs. at best to batter its massive walls.

It is to be observed that the whole force had the most supreme contempt for Afghans as soldiers and the Envoy did not expect opposition to the well-beloved king. The ordinary outlook was that the Afghan was only a form of Indian and to be fought on the same lines. So refreshed despite their bowel complaints the army marched away in its chakoes and its red coats, the officers with full dress in their uniform cases for the great doings when they got to Kabul. But Ghuzni was in the heart of the Ghilzai country and to the satisfaction of the army, it was held in force by "the Dost," [1] as was the fashion to call Dost Muhammad, the Barakzai chief who held as Amir the Sudozai throne. The Commander-in-Chief with his nine pounders was not so pleased about it, and while he surrounded the city the Ghilzais attacked the Contingent, with however no success. It was decided after the old British manner to blow in one of the great gates and storm, and this was done by the 13th Foot with Captain Peat and Lieut. Durand of the Bengal Engineers.[2] The gate was blown in, in the best Peninsular style and the 13th with various supporting parties of Bengal infantry, forced their way in and very fierce hand-to-hand fighting ensued. The British lost some 200 casualties and the Afghans some 500 killed. The citadel happily did not resist and many animals and much grain was captured. A garrison was left and the force, which contained three British infantry battalions and the 16th Lancers, marched on over the high pass between Ghuzni and Kabul, and wound their way down towards the capital. The Dost had sent a relative to ask what terms were offered him. All that he got was a promise of "honourable asylum in India."

[1] "The Dost" = "the friend", an ironic shortening of the full name.

[2] Afterwards Sir Henry Marion Durand, killed on an elephant when Lieutenant Governor of the Punjab at Tank on the frontier.

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Then a pitiful debacle took place. A long row of guns was dragged out to meet the British at Urgundeh a few miles from Kabul, but not a man would stay to man them. The troops in Kabul deserted the Dost, who vainly implored them to make one stand against the infidel. They melted away, all the chiefs and "Est-il-possibles" and the American Harlan, formerly in Runjhit Singh's service, who was in Kabul, reported that the guards and the rabble looted and destroyed his pavilions. So it really did seem that the view that the Dost was not cherished in his peoples' hearts was not without justification.

Early in August the army marched into the valleys round Kabul unopposed, and the Shah, a kingly figure enough with his flowing beard, was installed in pomp amid the roar of salutes and the lowering of colours. All was beautiful in the garden, the unfortunate Dost who could not but receive some sympathy had been chased over the Hindu Kush. The troops settled down to rest after their difficult marching and to enjoy the scenery and fruits of Kabul, at that season a veritable Kashmir. The Shah created a magnificent Order, that of the Douranie Empire, which was awarded to all and sundry of the fashionables in appropriate classes to the derision of those not so favoured. Most of these were recalled after the disasters, but one is to be seen at the Royal United Service Institution among the decorations of General Sir Thomas Willshire. By September 1839 it was decided that a British garrison must stay for a while to see the Shah and his contingent fairly established. The Army of the Indus itself broke up, the Chief with the cavalry and horse artillery coming to India via the Khyber, General Willshire and the Bombay troops returning via Ghuzni, Sir Willoughby Cotton remaining in Kabul with the envoy, Mr. Macnaghten, and General Nott at Kandahar. Both forces were Bengal troops and only the 13th Foot and some artillery represented the European portion of the army above the passes.

THE GARRISON AT KABUL.

We now come to the most interesting and fascinating part of the strange story, viz. the fraternization of the peoples. We were not yet enemies. Afghans flocked to the cricket and races. They invited officers to stay with them in their country castles. They hawked and shot together. Officers could ride anywhere,

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and the visiting of antiquities in the neighbourhood of Kabul was a popular amusement. The people of the city were delighted when the regimental artificers turned out skates which were unknown to the ice-sliding Kabulis, and everyone admitted that we really were a northern folk and understood a hard climate. The Afghan sirdars visited and dined with the messes, especially that of the always helpful and genial 13th. So the winter of the first year 39-40 passed happily enough with here and there some visit of troops to distant recalcitrants. The spring and summer of the next year passed happily too, though the obvious incapacity of the Shah and his hopeless though not unnatural policy of employing *emigrés* in high places was putting the whole Afghan world agley.

In this year the envoy insisted on starting a cantonment outside Kabul, and leaving the security of the Bala Hissar to which he and the Amir Shah had now returned after their winter sojourn below the passes at Jelalabad. So quiet was it all, and so like, let us say, conditions at Hyderabad or Secunderabad in the Deccan that officers' and soldiers' wives were brought up with children and ayahs and the like, all the way from Delhi and Meerut and Kurnal through a semi-hostile Punjab, there not being a mile of rail yet in all India ! The usual bungalows were built and cantonment life in very beautiful surroundings inaugurated. The English gardens were much admired, that of Lady Sale being particularly good both in flowers and vegetables and a source of delight to the Afghan ladies and Sirdars to whom as to the garrison she dispensed open hospitality. Kabul races were a great feature, and just as the Arabs in Basra and Baghdad flocked to them during the late war, so did the notables and townsfolk of Kabul and Kandahar take an enthusiastic share in the racing of their guests in 1840.

The Dost, however, returned and had to be met, and disturbances broke out in more than one valley. Just, however, as the British sustained something of a reverse at Purwandurrah and a blaze seemed possible the Dost lost all heart and rode into Kabul alone to surrender. He was sent to Calcutta in honour, where he was a frequent visitor to Viceregal Lodge, and remained, taking no part in politics till called on. His friendship and handsome treatment when with us, bore good fruit in the Mutiny when he kept his excited people off India.

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It is not proposed to study the strange set of happenings that 1841 brought in its train. There is abundant evidence of the political errors and super-gross military follies that induced the miserable state of affairs at Kabul in the winter of 41-42. An aged unwilling general much given to gout was sent up against his will to relieve Cotton. Everything went wrong, and when it did go wrong no one would grip the situation. All the good soldiers, and there were many in the junior ranks, had to sit by in disgust and see every advantage given away until at last the greatest disaster and humiliation ever met in India overtook the mixed brigade in Kabul—the envoy and all his staff murdered or prisoner, the force destroyed, the ladies and many officers prisoners or hostages, and the whole of India shaken with rumour to its foundations! But it was only thus in Kabul. Nott and his "beautiful" Sepoys were very much on their perch in Southern Afghanistan. Craigie at Kelat-i-Ghilzai, Sale and Monteath at Jelalabad with Broadfoot and Havelock stimulating them, were all at top of their form.

The prisoners were not released for many months, primarily as the result of the restoration of our prestige by the avenging armies, but very largely from their own immediate initiative led by Eldred Pottinger, the senior of the politicals in Afghan hands. They had at times had hard lines but had gradually been collected into the hands of higher grade chiefs and accommodated in good garden houses, though hurried off to Turkestan when Pollock advanced. A good deal of affection and sympathy was shown them at times in their vicissitudes, showing that the envoy's optimistic accounts of the feelings of the inhabitants towards us was not all imagination.

As usual the Bengal Artillery was much to the fore, chiefly the horse artillery, and during the disastrous retreat from Kabul it was the last gun that formed the rallying centre as it was forty years later, when after the happening at Maiwand Jack Slade and two guns of E/B was the last hope of the broken force in the dreary retreat on Kandahar. Seccombe's painting in the theatre of the Royal Artillery Institution shows another of the famous artillery incidents at Kabul, depicting Sergeant Mulhall bringing his gun off the Bemaru heights, and showing the battle dress of brass helmet and leopard skin, dress jacket and high red collar.

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The flat lace of the old jacket both of the Royal and Indian Horse Artillery was a less uncomfortable jacket to work in than would be the projecting round lace of to-day.

In this dress at the end of May 1857, a subaltern of the troop, then General Alfred Light, told me that Tombs Troop marched out of Meerut under Archdale Wilson for the Hindun and the Ridge at Delhi. A mile out of cantonments Tombs halted the troop and ordered the men to take their jack-knives and cut off their high red collars from the jackets. The quartermaster-sergeant thought the bottom had fallen out of the world. A week later the whole force had got into mud-dried drill cotton which the world has now adopted into its vocabulary in the Persian word for "dusty."

The "Avenging Army" was commanded by a gunner, Major-General Pollock, of the Bengal Artillery, afterwards Field-Marshal Sir George Pollock, Bart., in whose memory the Pollock Medal exists. He was practically the first artilleryman to command an independent force in the field, and a pretty stout and at times difficult old tyke he appears to have been.

THE ARMY OF WELCOME.

A finale of the war that took place at Ferozepore is worthy of memory. The new Viceroy Lord Ellenborough, for whom martial deeds held special glamour, had very wisely assembled a large army of reserve at Ferozepore to impress the Sikhs and stand by in case of trouble. He made it an occasion for a great welcoming of the forces of Pollock and Nott who with Sale's, Jelalabad defenders leading, passed over the bridge of boats on the Sutlej through lines of spick and span troops presenting arms, and under triumphal arches. The Viceroy, or more properly the Governor-General, had devised a medal with the very suitable legend "Victoria Vindex", with the rainbow ribbon really designed to represent the rising sun. The triumphal arches were wrapped in muslin died of these shades of which the war-stained legions were a little contemptuous, though no doubt in their heart of hearts somewhat gratified. It was nearly four years since some of them such as the 13th had been there before. But it must have been a stirring sight as the long battered columns came over the bridge and the receiving troops presented arms, and cannon roared the welcome.

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SOME NOTES ON TRAINING HORSES FOR RACING.

By Major J. E. T. Younger, R.A.

IN Great Britain only those favoured with large bank balances can indulge in "the Sport of Kings." But one of the compensations of service abroad is that it places this grand sport within the reach of the Gunner of slender means, be he even a subaltern. At stations such as Gibraltar, Malta and others, ponies, capable of winning races, can still be bought at a reasonable two-figure price. There is a peculiar satisfaction to be derived from the pride of ownership of a race-horse, more especially when he carries one's colours first past the post. This satisfaction is increased a hundredfold, when the owner has trained his horse himself.

Trainer's fees form the largest item of the racing bill. The "owner-trainer" eliminates this item from his expenses, and he creates for himself a golden opportunity of gaining knowledge about the noblest of animals, which nothing else could teach him. Imbued with such sentiments, the writer found himself at a Mediterranean station where racing flourishes. A racing pony was duly purchased, after a successful appeal to the banker's stony heart! So far, so good. The problem then was "how does one train a pony?", with the hundred and one questions which that involves. A search of the local libraries and enquiries in England failed to produce any really suitable handbook dealing with this subject. In the hope of making good this deficiency for any Gunner who may find himself in a similar situation, the writer has ventured to set out the small amount of knowledge which he has gained in the hard school of experience.

The subject is such a wide one, that only the briefest outline, with some hints and tips, can come within the scope of this paper; and it must always be kept in mind that practical experience is worth all the world's books and writings. It is impossible to lay down hard and fast rules of detail; horses differ in character and constitution; climates are a changeable factor, and individual horses vary in health and capacity for effort at different times and seasons. But so long as the owner-trainer's general principles are

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sound, experience will teach him how to deal with each case on its merits. It must never be forgotten that half of the training is done *in the stable;* unless a horse is well in himself, happy and contented and feeding well, the trainer cannot expect to get the best out of him. Success in training consists in striking a correct balance between proper feeding and adequate work. There are three distinct stages in the process of producing a horse fit at the starting gate, (a) the "conditioning" stage, (b) the "muscling" stage, (c) the "final preparation."

(a) *The conditioning stage.* The object is to get the horse fat, thus providing the trainer with the material out of which muscle is to be built up. The fat also supplies the horse with a reserve of energy. It will only be necessary to deal very briefly with this stage, as it ought to be familiar to all who have looked after horses and to every Gunner who has served with a horsed battery. Many more able pens than that of the writer have produced works applicable to this stage. It lasts till the horse is well covered all over, and is sleek and round.

Work. One and a half hour's walking exercise, led or ridden, will be sufficient to commence with. Short, slow trots on alternate days can soon be included. The guiding principle is that the work need just be sufficient to enable the horse to digest his food properly and to prevent him getting "humoury." He must never be allowed to sweat unduly.

Food. Regularity in the hours of feeding is as vitally important in this stage as in the other two stages. There should be four feeds daily, if five so much the better. Let the first feed after exercise and the last feed at night be the largest. A corn ration of from 8 lbs. to 10 lbs. of oats (or barley in foreign stations where good oats are difficult to get) will be sufficient; add 1 lb. of bran to each feed and mix some chaff with it to aid mastication. A linseed and bran mash, every Saturday evening, is very valuable, and a plain bran mash every Wednesday in addition, is recommended, until cantering is commenced, when this second mash must be discontinued. The horse should have as much good quality hay as he will eat; give green food if obtainable, but not in sufficient quantity to make the horse "scour." Carrots sliced lengthways should be given every day; and a handful of peas or

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beans is a fattening addition to the daily ration; these latter should be used with discrimination however as they are very heating. There should be no need to resort to patent foods, treacle, molasses, and such expedients. Provided a horse is healthy, regularly fed and properly groomed and exercised, he will get fat on the foods mentioned above. The value of linseed as a fattening agent must not be forgotten. Half a pound a day is sufficient. It must never be forgotten that to get a horse fat he must have bulk; about a 25 lb. ration in all. In the word bulk is contained the secret of fattening horses. Mangers should be cleaned after each feed, especially after a mash; a horse will not feed properly out of a manger caked with sour bran or stale corn. In this, as in the other stages, the writer is a strong advocate of keeping a bucket of fresh water always in the stable day and night.

Grooming. Special attention should be paid to grooming during this period, where the horse is only doing a small amount of work. A good wisping every evening is most beneficial.

(b) *The muscling stage.* We will assume that the owner-trainer has his horse well covered with flesh with a nice sleek, satin coat. He must now turn the flesh into muscle, retaining the satin coat.

Work. During this stage, which will last two or three months, the secret of success is long slow work; this is what produces the muscle. The work must however be progressive throughout the muscling period, as it is also a preparation for the fast and severe work demanded in the final stage. At the outset the horse should go out for four hours walking daily. Trotting may soon be combined with the walking, gradually prolonging the periods of trotting and increasing their frequency. After two or three weeks of this, the horse may begin to canter; take him easily in his first canters, beginning with a duration of about two minutes, and working up to a duration of five minutes. Be careful *on no account ever* to allow the pace to exceed a canter. It must be explained that in racing parlance a canter is really a gallop in which the horse is well held and in no way extended or allowed to approach racing speed. A horse should be made to lead with either leg in his canters. Now that the stage of real "work" is being reached, it is opportune to set out one or two ideas regarding the work. In the

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author's opinion two hours at a stretch is quite long enough for a horse in training to be out of his stable. Long hours spent out at work mean long hours without a feed; it is most important to arrange the day's work so as not to interfere with the regularity of the feeding hours. The horse should be accustomed to receiving food at constant intervals, so that his system gets into the habit of functioning uniformly; in other words he must learn to be a good "doer." All work therefore will be done in instalments of not more than two hours' duration as a rule. Canters may be given on two or even three days in the week; and one or two canters may be ridden on any one day, according to the horse's condition. On days on which a canter, or any faster work is carried out, it is best to confine the afternoon work to one hour's walk led, not ridden, thus resting the back muscles.

A critical period has now been reached, when continual care and attention must be paid to the horse's legs. Adam Lindsay Gordon was a very wise man about a horse, as well as being a poet, and he wrote:—

"All hurry is worse than useless, think
On the adage 'tis pace that kills:
Shun bad tobacco, avoid strong drink,
Abstain from Holloway's Pills."

The last two lines, though very sound, are hardly applicable to the case in point, but the first two indicate that undue hurry to get the horse galloping means grave risk of a breakdown. From this stage onwards a horse's legs should always be inspected before he goes out to his work, and no work should be attempted if any heat, puffiness or tenderness can be discerned. In such a case, if not serious enough to demand complete rest, the horse must be put back to walking exercise for a day or two; apply hot water bandages, followed by cold water bandages as soon as the inflammation has subsided. Do not, however, leave a horse to spend the night in wet clammy bandages; make him comfortable before he is left to settle down by putting on warm dry bandages.

A couple of weeks or so after cantering has been commenced progress can be made (with discretion however) to a half-speed gallop. In the half-speed gallop, as compared to the canter, the horse is not held so hard, and is allowed to extend himself a certain

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amount; but he must not approach his fastest pace. It is difficult to suggest the distances of these half-speed gallops; they depend upon the state of fitness of the horse and the distance of the race contemplated. A safe guide is that the horse must never be distressed at the end of his gallop; he should always finish up ready for more. Start with one gallop a week, working up to two a week, which will, as a rule, suffice.

During the whole of the muscling stage the work indicated above should be arranged so as to give the horse variation in his exercise. Monotony bores a horse just as it does a human being; variation helps him to concentrate on his work which is very necessary to enable him to get the fullest benefit from it. At exercise make him walk out and trot up to his bit; keep him collected and don't allow him to flop along as he likes. In his canters he must learn to stride on with a long, swinging easy action. A horse likes company in his work; but if two horses are to gallop together, they must go level at the same pace all the way, the riders keeping knee to knee. Therefore see that distance and pace are within the powers of the least fit. No horse is improved by being left behind in a training gallop; a trial is a different matter.

It has already been explained that, when treating a subject such as we are considering, only broad principles can be set out.

But a sure guide to the amount and pace of the work during this stage is the general state of the horse's health as indicated by his coat, eye, carriage, and looseness of skin, coupled with his appetite and the state of his legs. A study of each individual horse will reveal the routine which suits him best.

Food. During the "muscling stage" work gets gradually more severe; and it follows that the horse's ration must be increased. This increase should be progressive in the same degree as the work. Raise the daily corn feed gradually from 10 lbs. up to 16 lbs. As the amount of corn increases so the bran will be decreased down to a double handful in each feed. Retain only the Saturday evening linseed and bran mash; green food, peas, beans, etc., must be reduced as the corn increases. Continue carrots, however, as they are always wholesome. Hay should not be given so liberally; 10 lbs a day will suffice. If a horse shows any inclination to go off his feed, ease up his work immediately and give him an extra

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bran mash, as required, on one, two, or possibly three consecutive evenings; 2 ozs of Epsom salts mixed in the first mash is a salutary remedy for restoring the system to health.

Now that the period of high feeding is approaching a continual careful watch must be kept upon the horse's general internal health right up to the day of the race. His droppings should remain normal, neither hard nor dry, nor loose and frequent. If hard and dry, the bran mashes mentioned above are indicated; if loose and frequent substitute dry bran for corn till an improvement is observed, adding if necessary a teaspoonful of ordinary flour to each feed. If the droppings become at all evil-smelling or slimy, or if the urine gets dark, the novice should consult a veterinary surgeon. A further indication of the horse's health is afforded by the membrane of the eye; it should be a clear pink, not red and inflamed, or pale and yellowish. In either case resort to bran mashes and less work; if this does not rectify matters, it is best to seek the vet's advice.

(c) *The final preparation.* This is the stage in which the real art of the trainer finds its full scope; and the owner-trainer will learn that it has a fascination of its own. Nothing but experience can teach the "finesse" of keying up a horse to the zenith of his fitness at the right moment. Some individuals seem to have an intuitive "flair" for this, which less fortunate owner-trainers can only envy. How many horses have done their final gallop at winning form, and in consequence have gone to the starting gate just over the summit of fitness—in other words a shade stale. This is the pit into which the owner-trainer will be led by his keenness; and when all is said and done the avoidance of it constitutes the artistry of training. It will be much more obvious to the novice when a horse is short of a gallop, than when he is just coming within an ace of his zenith. It must be realised that during training a horse's condition never becomes stabilized for any length of time; generally speaking he is either improving or deteriorating. The aim of the pages which follow is to describe the signs and portents, so that the owner-trainer may know whether the barometer of condition is rising or falling. Before beginning to describe the work required for the final preparation, it is appropriate to try and give a word picture of what the horse should look like at this stage.

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The sleek, round, even contours will have disappeared. The horse's muscles will have become clearly outlined and distinguishable. His quarters will show the so-called "poor man's mark," which is really the division between the two main muscles. His thighs will be full, round and firm, and his fore-arm well developed and hard. His back muscles should completely fill up the space between his ribs and the upper tips of the vertebræ. His eye will be clear and bright and his coat like satin.

Work. The owner-trainer's object during the final preparation demands very different work to that previously carried out. His chief concern will be to develop the horse's powers of respiration; this in itself contributes largely towards the necessary physical fitness which the great muscular effort of galloping fast demands. It is only the thorough and progressive work done in the muscling stage which will enable the horse to avoid grave risk of injury in this final period. In the gallop a horse's action differs entirely from his action at any other pace; therefore he uses his muscles differently and they must be gradually accustomed to withstand the unusual strain and stress. As a general rule two gallops per week are as much as a horse should be given. Presuming that the horse has done several half-speed gallops of at least one mile during the final period of the muscling stage, his first faster gallops should be of two or three furlongs length. For example he can go for a mile, cantering till he gets to the last two or three furlongs when he may be allowed to gallop. The distances of gallops can be gradually increased; the final distance will depend upon the distance of the race for which the horse is being trained, and upon the horse's capability and fitness at the time. Sometimes a horse will require to go less far and faster, sometimes farther and less fast; he will seldom need to go farther and faster. Unless a horse is a sluggard and lazy, he should not usually be pushed in his training gallops and he should, as a general rule, be eased up if and when he ceases to pull, for this is an indication either that he is not yet fit to go so far at such a pace or that he is getting stale from too much fast work.

In each case the remedy is obvious. The owner-trainer must not think that it is necessary to give a horse a lot of fast gallops over long distances; a horse trained by a series of short, fast gallops

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may well win races over a longer distance. It is claimed that this system of short, fast gallops is a safer one for use by the novice, until experience has taught him to divine exactly what nature of gallop a horse requires at any given moment. As regards the actual pace of the gallops—the half-speed gallop has already been described. There is the gallop at three-quarter pace or "on the bit," and there is the fast gallop which is at racing speed without holding the horse, but without pressing him. Do not confuse this with a trial, which is quite a different affair. In the previous stages of training the question of the weight carried by the horse when he is doing slower work is not of very great moment, provided of course that he is not asked to carry a heavy weight regularly. No harm will be done if he carries 11 stone 7 lbs. or even 12 stone in his slow work, though obviously a lighter weight is preferable. At the same time it is a good thing that a horse should be accustomed to carry a reasonable weight in his slow exercise approaching the weight he may be asked to carry in a race. Once, however, that fast work is undertaken it is a very different matter; the horse must invariably carry a light weight in his gallops to reduce risk of breakdown. A heavy weight tends to shorten his stride, which is not at all desirable. Furthermore, with a light weight up it is easier to gauge a horse's progress. For example, a horse that has galloped a mile carrying a light weight and pulling all the way may well be fit to run; nevertheless it does not at all follow that he is not fit to run, if he will not do this carrying something in the region of 12 stone. It will not be out of place here again to emphasize the importance of regularity of routine in the training of horses; work must be so arranged that they go out and come in at approximately the same hours every day.

This safeguards adherence to the hours of feeding. A specimen programme of a week's work towards the end of the training might be somewhat on the following lines:—

Monday.	Three-quarter pace gallop, 6—8 furlongs.
Tuesday.	Walking exercise.
Wednesday.	Walking exercise with one canter of four minutes.
Thursday.	Fast gallop, 5—7 furlongs.
Friday.	Walking exercise.

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Saturday.	Walking exercise with two canters of three minutes or possibly a half-speed gallop of one mile.
Sunday.	Rest.

The foregoing is only a specimen, and is capable of unlimited variations to adapt it to the needs of the horse and of the moment. It is very seldom possible for the soldier owner-trainer to supervise all the exercise in person, but he is most strongly urged never to allow his horse to do any fast work unless he is present. This may involve overcoming a distaste for early rising; but the effort will be generously repaid both in added knowledge and in pleasure (for the early morning is often the best period of the day) and eventually, we may hope, in profit also. As well as watching the horse closely over every yard of his gallop—if he is not riding himself—the owner-trainer must size the horse up as he comes away from it. During the gallop he will expect to see his horse swinging along with an easy stride pulling all the way and full of running and of the will to gallop. After the gallop, if the horse is fit he will stand up alert and on his toes; his eyes will be bright and open, not drooping or looking upwards. If he looks dull or exhausted this points towards easing up fast work. His nostrils should be distended and open, showing the red lining and clear of discharge, and his flanks should be heaving gently, not working like bellows; in other words he should not be blowing. If this standard is not reached more fast work is indicated. A further guide to the state of his powers of respiration is obtained by noting whether he "blows his wind" or not, and if so, how soon he does it after pulling up from his gallop.

This is not an infallible test as horses vary in the readiness with which they "blow their wind"; nor is it a "sine qua non"; nevertheless it is a very helpful phenomenon. It must be explained that "blowing the wind" means giving a clear puff or almost a sneeze soon after pulling up from any fast work. Its occurrence indicates that a horse is clear in his wind. If he gives more of a thick cough or does not blow his wind at all more fast work is required, unless the horse is one who habitually does not blow his wind regularly.

Another useful guide to the muscular fitness of a horse is the

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state of his back muscles; he should feel soft and pliable behind his withers and at the back of the saddle. All these points must be registered at a glance by the owner-trainer for they help him to determine what his next move will be; they are especially useful to him if he does not ride gallops himself, as they afford him a check on the report of the rider. If after a gallop a horse is blowing slightly or is a little bit thick in the wind, but is otherwise fit and does not require a gallop of any length, the following is a useful method of clearing up his wind. Walk him round for twenty minutes to half an hour; then send him full speed for about 150—200 yards; he must be jumped off sharply into his full speed and he must go all out the whole distance. There can be no half-measures, as these would only give the horse muscular effort without obtaining any advantage from it. In all gallops, but especially in a short very sharp dart such as has just been mentioned, great care must be taken to pull up gently and gradually; neglect of this involves grave risk of injury.

Fast gallops are the only means of developing a horse's powers of respiration to the pitch required in racing. If a horse's legs show signs of not being able to stand up to fast work, or if the ground is very hard, it is possible to get a horse reasonably fit by recourse to trotting up steep hills and swimming; these are, however only expedients for use in emergency and are at best poor substitutes for the real thing.

As a rule a stolid, thick-set horse will stand more fast work than a nervous lightly built horse. The latter type of horse is inclined to get fine drawn with much fast work; such horses, however, are usually clearer in the wind than the former and therefore require less galloping. In case of the former type it may be necessary to sweat the horse artificially to get some of the beef off him. This can be done by working him in a hood and thick clothing; he should be trotted or cantered, according to weather conditions, till he is sweating freely; the sweat should drip off him, running down to his fetlocks. He must then be scraped, and put into a fresh set of clothing and led round till he is dry. Every precaution must be taken to prevent him catching cold, and it is necessary to watch for him breaking out again. The objection to leaving him ultimately in sweat-sodden

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clothing is obvious. A horse should not be artificially sweated within fourteen days of a race.

During the final preparation, the way a horse scrapes and the quality of his sweat gives a good indication of his condition. An unfit horse is fat inside as well as out; the process of training, so to speak, drains all the fat out of him; but there is a limit to this. If a horse has too much fat taken out of him, he runs up light and his nerves become too highly strung; this is equivalent to saying that he is stale. During the earlier stages of a horse's training the sweat is a greasy lather to touch; as he progresses his sweat becomes less and less greasy. When he is fit to run his sweat will be watery, and he will be dry almost directly after he is scraped; if one strokes him, the sweat picked up on one's hand should not feel greasy and should dry quickly.

In many stations abroad it is necessary to carry out training gallops on a galloping track on the racecourse itself. In such a case there are several points which it is important to bear in mind. A horse has no reasoning power; but he is very quick to associate certain places with certain happenings, and he has an excellent memory. Consequently he knows very well the significance of the winning post. If, therefore, he has to do his training gallops on the course where he will also run his races, care must be taken that he is not pulled up till he is well past the winning post. He should also invariably come off the course by the same exit as that by which he will come off when racing; otherwise he may slow up in the race or try to run out when he arrives at the place where he has left the course in a training gallop. By every means in his power the owner-trainer should try to make the racecourse a place of pleasant associations for his horses as far as is humanly possible. A horse is not going to produce his best effort if his feeling is "here we are again at this beastly place where they make me gallop till I am tired and my legs ache and then beat me." A horse knows the difference between a race and a training gallop just as well as his trainer; he knows that in the race an effort is demanded of him which is never demanded in a training gallop. It is a most lovable trait in a racehorse's character that, when faced with the real thing, he gives of his best gladly to the last ounce of his strength.

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It has already been mentioned that horses like company in their work, and that in a gallop they must remain level throughout. Whether a horse is galloping alone or in company, he should not go off from a standstill. He should walk, trot a few paces, canter a couple of hundred yards and then extend himself into his gallop. This avoids sudden strains, and gives the horse a chance of settling down and finding his stride; in the case of two horses galloping together it enables them to start away level. A word of warning—on no account be carried away by the excitement of the gallop into allowing it to develop into a trial. Trials are seldom of much advantage to the owner-trainer unless he is thoroughly experienced; they may easily furnish the beginner with highly misleading information. In any case a trial must be ridden at definite weights and on fit horses if it is to be of any merit.

While on the subject of trials, mention must be made of the use of the stop-watch. By all means time a horse occasionally in his gallop; but never force him to cover a certain distance in a certain time. There is a great difference between the two things. The watch can often give a very useful indication of the horse's progress or of his form at a given moment. But the watch is not infallible, it only gives an indication of form. Its frequent use is not recommended, as this may lead the owner-trainer to make a false move. To slog a horse along gallop after gallop against the watch is an abomination. Perhaps one may say of the stop watch:—if the time be good, be pleased but proceed warily; if the time be not good, don't worry too much.

Finally, once a horse is racing fit, comparatively little work is required to keep him so. No hard and fast rule can be laid down, but as a guide two fast gallops in any week in which a horse is not racing, and one canter, constitute a maximum of work outside walking exercise. A "pipe-opener" is a short, fast gallop, say two furlongs, to clear up any little thickness of wind in an otherwise fit horse. It may be given on the day before the race or even on the morning of the race.

Feeding. The system of feeding during this culminating phase is much the same as during the previous stage. There are, however, one or two points to be noted. The horse should be allowed to eat as much corn as he wants. He should be worked up week by week till he consumes his maximum during the week

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of the race. Within reason, the more he eats the better. He may have a double handful of bran mixed into every feed. The usual Saturday bran mash will be retained, unless the horse is going to run during the ensuing week. Linseed and such fatty foods must disappear from the ration. A linseed and bran mash on the evening after a race, however, is beneficial. Chaff may be mixed with the feeds, but long hay must be sparingly used. Long hay is bad for a horse's wind, and he should not be given any within a week of running. The same applies to chaff. When consuming as large a corn ration as he should now be doing, bulk is no longer necessary. Carrots are always a welcome addition to the ration at all stages of training. Give five feeds per diem; the largest feeds should be that given after the morning work, and the last feed at night. Horses eat well at night as a rule. It is most important that mangers should always be kept sweet and clean. Stables should always be fresh and well ventilated. A horse's lungs cannot be at their best if he is made to live in a smelly, ill-ventilated stable. Any report that a horse is "off his feed" must be treated with discrimination in order to determine its proper significance. Serious loss of appetite points to too much fast work. But while being fed so highly, a horse's appetite must vary and one day he will eat more than another. There is therefore no reason for the owner-trainer to worry if a horse does not clean up a feed to the last oat on any given day. A knowledge of the horse's feeding habits will tell the owner-trainer when he need begin to worry. For owners stationed abroad it should be mentioned that oats (even bad ones) are the best food for a racehorse. Failing crushed oats, crushed barley is the next best racing feed. Corn of any kind must be served up to the horse clean, not full of dust and other foreign matter.

There should be no need to point out that a horse cannot be expected to gallop his best with a belly full of corn or water. The owner-trainer must insist upon rigid adherence to feeding hours, and horses should be allowed peace and quiet while they are feeding. Keep water by them always and be sure that they are allowed to drink well. Insist on extra good grooming and wisping, for it must always be remembered that the race is more than half won in the stable.

The day of the race. After weeks of anxious care the great

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day has arrived at last. How is the prospective winner to be treated immediately prior to the race?

The last feed of the previous night should be halved. Give the horse a good drink and about 1½ lbs. of corn first thing in the morning. He should be led out for about half-an-hour's walk and then well groomed. He will be allowed another feed of 1½ lbs. of corn, the time of which depends on the time of the race; the rule is that the horse should have no water or food within at least three hours of the start. The longer the race the harder should a horse be set (i.e. starved), the period varying from three to five hours before the start. Saddlery and gear should all have been carefully looked over two or three days previously to allow time for any necessary repairs to be carried out. If the horse is to run in shoes, these should be looked over. The groom must be told the exact times of feeds and the hour at which water is to be taken away and the muzzle put on. He must also know what hour he is to leave the stables.

Horses should be led, not ridden, to the racecourse. It must not be forgotten that the horse knows the race day as a rule just as well as his master does. Whether the owner is riding himself or not, he should personally superintend the saddling and see that his horse is ready to the last buckle. He should invariably give his instructions himself to his jockey, not through the mouth of his groom or other deputy. The frailty of human nature may very easily modify them before passing them on to the jockey, all unknown to the trusting owner. After the race let the horse have a few swallows of water, and walk him round till he is cool. Freshen him up by sponging out his eyes, nose and dock. Massage his back and loins, and get him back to his stable as soon as possible. If he has not won when you expected him to, don't be too disappointed; he will probably atone for it by a surprise win later. Always remember that it is the unexpected which happens, and racing is no exception to this rule. It must again be emphasized that these lines can only be the roughest guide to a fascinating occupation full of the greatest artistry. No written or printed word can replace the teaching of experience, often dearly bought.

For what's worth having must aye be bought,
And Sport's like life and life's like sport,
"It ain't all skittles and beer."

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A MOTOR JOURNEY FROM CAIRO TO OSTEND.

By Equinox.

MY friend Snodgrass and I were stationed at Abbassia, near Cairo, last year, and were given leave to England on the same day. He and another of our mess shared an Essex car, in which they both wanted to cross Europe on their way home. But as the two owners could not get leave at the same time, Snodgrass took me on this most interesting journey. Economy was essential since we were determined not to spoil our leave nor to exceed the cost of passage by ship. We therefore decided to travel fourth-class by ship across the Mediterranean, and to sleep and eat as far as possible out of doors.

Towards the end of July we left Abbassia in the Essex saloon in the early morning for Alexandria, with many suit cases, valises and blankets, and a small supply of tinned food. Leaving a simple mud-track road in order to see the Nile Barrage, a sluiced river dam which holds up the essential waters of the great river, we found difficulty early. Being on the wrong side of a canal, we had to cross it by a ferry barge on to which were crowded cattle, sheep and peasants, all most unsavoury. After a very hot and wearisome drive we reached Alexandria in the early afternoon, and set about providing ourselves with Italian money, petrol, oil and stores for the car. After tea, having enquired about our ship which sailed next day, we went in search of a beach on which to sleep the night; for Alexandria owns some very exhorbitant hotels. But after much driving through flat sand country, infested by croaking frogs, we were compelled by the unwelcome attention which we met everywhere to go back to the outskirts of Alexandria, where we found a place for the car and ourselves near some big villas on the beach. We rolled up in horse-rugs and slept fitfully, awakened at two-hour intervals by gaffirs on guard over house property. The sea breeze was refreshing after the July desert climate. After breakfast next morning we drove at 10 a.m. to the docks. Surrounded by worrying Egyptians we argued at length with the customs over two shot-guns we were taking to England.

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As we were to travel fourth class, the emigration examination was a little trying, it being necessary to herd into pens with Egyptians, Greeks and Levantine half-breeds. Boarding the car once more on our way to the ship, natives kept jumping onto our running boards; some were scraped off by passing vehicles, others remained to be disappointed in discovering that we were not cabin passengers and potential givers of backshish but fourth class passengers whose gear was to remain in the car. They proved to to us volubly that we had brought them there on false pretences, that we owed them money for their attendance, and that it was wrong of us to have kept them waiting so long.

The car was slung on board, and we soon had it cleared of kit for sleeping room. Seats were taken out, and the baggage stowed on a hold covering, where an Arabian fellow passenger made it into a wind screen for himself. (We afterwards met this man in Peterhead, Aberdeenshire.) We got deck chairs and some green bananas, which we hung inside the bonnet of the car, out of the sun. Two bananas each, some biscuits and beer were food for that day, during which we slept from the time of weighing, about 1 p.m., almost continuously. Having fever, I was glad to see the palm trees sink into the horizon, to feel the sea breeze and to know that the inaction induced by sandfly fever would soon leave me. We rose early on Saturday. It is difficult to sleep in a motor-car on a deck which is being swabbed and hosed by singing Italian sailors. Also we were become a sort of show among the third and fourth class passengers: little brown and black infants were held up by their parents to see the curious Englishmen who slept in a car. We rose rather indignantly (that was a star turn to the audience, who clapped their murky little hands) and had a wash and ate a banana. Knowing a second-class passenger, we were able to shave in a cabin. The morning we spent in deck chairs on the forecastle, reading. We were allowed into the second-class bar (the Italians seldom despise custom) but were given no food. The saloon was usually full of Greek Church ministers, a dirty crowd, rocking on their feet and chanting prayers. They tried to face the east for their almost hourly performance, but their orientation was noticeably unscientific.

By this time we were passing close to Crete. Though barren

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and rocky it was great to see mountains after palm trees and arid flatness. The day passed delightfully and apace. We did some mechanical work to the car, but spent most of the time gazing at Greece, and into the ultramarine. On Sunday we made Brindisi about noon. Flat land with a small harbour and fort, little shipping and an edict against cameras. In the Latin confusion of arrival at a port it was impossible to find out how long we should berth: but being told one hour, we went ashore and found in the main street an excellent restaurant, sunbaked and sleepy beneath an awning. Here we ordered fish, which we inspected swimming, an omelette and macaroni. Hardly were the fish fried and the wine uncorked when a blast from the ship's siren claimed us from the fairyland we had found. As the ship stood out to sea we had plenty of time to reflect on the joys of cooked food.

We made a careful toilet next day preparatory to landing at Venice. Towards the north of the Adriatic the colour of the sea changes to green. The Italian coastline lay below the horizon, owing to its flatness, but the Austrian hills stood out distinct. At noon we disembarked. All kit was locked inside the car, on whose radiator cap was tied a label saying in English "to be called for at Trieste." Turning our backs hopefully upon our belongings we took steamer from the pier to the Lido, armed only with passports and money. Lido struck us as an island of garish vulgarity: massive hotels, endless bathing huts each with a flag advertising drink, and many motor boats. After a wonderful meal we changed into bathing shorts and slept on the beach until we were energetic enough to bathe, for it was as hot as at Alexandria. Refreshed by the swim, we took steamer to Venice, leaving the noise of the motor boats and aeroplanes behind.

Venice was indescribably restful in the evening light. The decorative simplicity of San Marco and the oily stillness of the Grand Canal were intensely soothing. Bareheaded people walked everywhere in the narrow streets; their shops for the most part held cheap goods and ugly clothes. One's impression was of a lovely city partly desecrated by modernism: a city in which to spend an hour for atmosphere or a year for knowledge. Vowing to return we caught the 20.45 train for Trieste. The journey, second class, was uncomfortable, especially when a bottle of beer

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in the rack above me blew its stopper: but after five hours our dawdling train drew in to Trieste from Monfalcone. We gladly found a new Teutonic hotel furnished in imitation walnut, the hall-mark of efficiency, providing a most comfortable bed and an excellent bath for five shillings, our first night's comfort for six days.

On Tuesday we made our way to the docks about seven o'clock, where we found our car alone on board except for a few deck hands. With some English, and a little Italian money, we persuaded the crane man to swing her ashore: a job made dangerous by the knotting done by the deck hands. Passing the empty customs-house, we arranged for the two shot-guns to go by rail to London, and bought food for the journey, changing some money into Italian and Austrian notes. We drove westwards along the rising coast road to Monfalcone: the country was green, dusty by the roadside, with cypress here and there in the churchyards. At Monfalcone we had our first puncture, which we soon mended. The next two hours took us to Udine, a charming town with a town-hall whose pink and white marble looked delightful down the narrow street. There is a beautiful clock-tower, square and dominant, with tones as wonderful as those of San Marco. After mending a second puncture we drove off at four along a dusty straight road to the foothills and Gemona. The roads held many single shafted carts drawn by a single horse on the near side of the shaft: these strayed over the road out of control of their sleeping drivers and caused us occasional delays. We met and were passed by many cars, always fast and with loud exhaust, mostly Fiat and Lancia. One enters Gemona up a steep hill: it has an imposing, rather Spanish look, with grim walls and rock foundation. We passed up the valley of the almost dry Tagliamento alongside the railway to Tolmezzo and Ampezzo. From here the road steepened, the fields containing fat sheep and fenced with posts and rails and stout hurdles. Many villages held regular troops on manœuvres and in billets, healthy, dark and of small stature.

As we rose to 2000 feet night fell, and the air became sweet, cool and intensely exhilarating. After the Nile delta, the Adriatic and the dusty plains we had crossed that day, the country seemed the cleanest, most enchanting land imaginable. The flat coast of

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Egypt with its languid haze and silly palm trees was a sickly thought of yesterday: gone was the lethargic Arab, and instead we met the gaze of vigorous active peasants: until coming to the summit of a pass, we drew off the road onto the wonderful springy turf, right at the top of the world. Putting down our bedding in the half light, we turned in about half-past nine. Owing to punctures we had only done 150 kilometres that day, but were well satisfied with our progress.

We awoke to a fine sunrise at 4.30 on Wednesday, and went towards a spring whose waters could be heard near by: but sound travels far in that clear atmosphere and it was on an adjoining hill some two miles off, so we had to go unwashed. After changing a flat tyre we left at 5.15. Within an hour another puncture halted us: we vulcanised the two tubes and were not awheel until 8.30. In two hours we made Laurenzago, where we halted for petrol and to change more money; this took time, as they had to telephone to find the rate of exchange. After a detour over steep and bad roads to avoid a fallen bridge we made Piave at 2. In an hour we reached Cortina, lying in the wide shallow valley of the Ampezzo, among green meadows, with a far-off fringe of deep pine forest. Above this, farther yet, stood the high bare Alps, grey and rosy in the lowering sun. For those who are tired or lazy, and only want mountains as an agreeable decoration, Cortina must be perfect, summer or winter. But for our mood and mode of travel the hotels, cars and petrol pumps showed too much civilization. The roads were full of cars, Fiat, Lancia, Ansaldo and Cirano, driven by goggled scorchers: mostly with gauze or netting to protect the radiator from flying stones. We sent off postcards of the Dolomites in a mechanical sort of way, and made on northwards up the valley under the wonderful grey-pink granite peaks, through forests of fir trees to Toblaco, a vulgar villa-strewn village of tea shops and hotels, full of walkers and motorists. Turning westwards, we passed along a flatter valley road, making good going through a country of crops and grass, with good jumpable rails and hedges. Two more punctures that evening retarded us, so that we did not make the Austrian frontier at Brennero until nine. Formalities took an hour at the customs-house, although we were spared search of the car, and in falling rain we halted on the road

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by a stream which sped on down the Austrian side of the pass. By this time it was too late and too wet to find a field in which to park, so taking the luggage out we placed it on the front buffers, covered it with horse-rugs, and slept at full length in the car, leaving the lights on.

Every now and then a fast motor passed; in the falling rain recollections of palm trees and sun seemed less unattractive. However we managed to sleep dry. Awakening on Thursday to a flat tyre, we pumped it up in the wet and made towards Innsbruck. The Austrian customs people had pasted to our windscreen a notice reminding us to keep to the left, which we did not find easy at first. Soon two more punctures delayed us, so we sheltered in a barn belonging to an Austrian sportsman in check tweeds, shorts with pearl buttons on the sides, and a Tyrolese hat. He chatted to us for some time in a knowledgeable way about Egypt and England until, with the help of his chauffeur, we had vulcanized and replaced the two tubes.

We reached Innsbruck about eleven, after a journey down pleasant slopes dotted with shining white farm buildings, meeting many holiday makers on their way up to the mountains, all walking with enjoyment. Here we had some work for a garage. It was raining very hard, and by the time we had changed some money and had a meal, our feet were very wet. We were delighted with the shops and the lay-out of this pleasant town, once an Imperial city, and with the Cathedral and the pictures in the palace, including one of the Emperor Franz Josef as a young officer in a beautiful white uniform. This palace contains a series of rooms of which the connecting doors are just out of alignment, giving a curved vista through the rich apartments facing the square. Buying food for our journey we left at 4.15, the streets being full of walking folk and children, in many cases organized in squads.

Turning westwards, we made up the Inn valley towards the German frontier: the country was perfect, green fields and flowers, fine cattle and many dairies. Mountain peaks hung in the sky, but we crossed only minor spurs. The roads were steep and full of S-turns, but the surface was good. Working upwards, we reached the frontier pass of Steeg at nightfall. The German dollamt authorities were courteous and efficient, and their neat white customs-house clean and well run. On each side of the pass, north

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and south, ran pastured slopes towards the crowning fir-woods and pink rock summits of the mountains, for the sun had set red. The air was still and restful: the only sounds were rushing water of the many mountain streams, and low sheep bells tinkling musically. Leaving the road we drove up the turf to a resting place. The thought of beer seemed very good and we were hungry: but the hamlet nearby was abed, so we supped on mountain air and went to sleep under blankets on the soft turf.

During that night it rained: one moved to the car; the other braved it under a horse rug, and on Friday morning was numb and wet. We made early start down the valley past white farms and through a lovely pastureland, by Sonthoven and Immenstadt, but the country flattened and grew tame towards Lake Constance. At Röthenbach we gave a lift to a German boy on a walking tour. Having no room inside he had to be carried lying between the bonnet and the off-side wing. Here he travelled happily for twenty miles. He amused us by putting on a hair-net to keep his hair undishevelled by the wind, and by waving to every fräulein we passed.

We went along the flat north shore of Boden Zee to Friedrichshaven, the home of the Zeppelin. Great sheds dominated the place. The country was uninteresting, but with many orchards and the most charming bridges of wood with thatched roofs. Through Stockach and Aach to Geisingen, we passed up the Danube to its source, Donauschingen. Here water flowed from taps and pipes, clear and sparkling, from which we filled our four water bottles. The afternoon took us through the south edge of the Black Forest. The country was partly Wiltshire down, partly New Forest, and towards Freiburg like North Wales. The Feldberg lay to the south with its thousands of feet dwarfed by the slow rising of its slopes. We made good going into Freiburg, a university town, for the roads were excellent. Here the sun lit up the clock-towers of blue and gold adornment, whilst clear water ran in the gutters. Neat trams passed in procession, and there was an air of uniformed contented orderliness. We ate, at about six—our first proper meal since lunch at Innsbruck—some game bird of the Black Forest, highly spiced and helped by black bread and Munich beer. After a visit to a well-organized post office we left about seven, intent on crossing the Rhine that evening

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by the nearest bridge. Reaching it at eight-thirty by country lanes, we found we were unable to cross, for the Rhine ran high after the recent rain, and the bridge was out of action owing to the lowering of the weir.

There was nothing for it but a fifty kilometre run northwards to Strasbourg, with no hope of crossing that night. Travelling direct upon a third-class road through Rhineland village after village, each like the last in lay-out, we found ourselves about ten o'clock in a field, the road having expired. Here we spent the night, by a dyke at the edge of an orchard. There were many mosquitos; but one of us had a hoop and net brought from Egypt, the other slept stuffily in the car with all the windows shut. The hoop had lived on the back of the car for a week, the admiration of children wherever we had been. Now it justified its carriage.

Four-thirty a.m. on Saturday found us still in Germany with two days in which to reach Ostend: where we proposed going by way of Rheims. With daylight we discovered telegraph posts above the trees, and were soon on the road for Kehl, the bridgehead, which we made at six. The German customs authorities were smart, alert and efficient: the French unshaven, dilatory and fussy. Here for the first time our kit was thoroughly examined. During the formalities, whilst a puncture was repaired, a French cavalry troop passed at exercise. The men looked tired and rather grimy, but sat beautifully in their saddles on horses the picture of fitness and care. On the German bank of the river the French occupation was very obvious.

Strasbourg held a mixed population. One could distinguish signs of the French ownership of the early nineteenth century, the German administration from 1871 to the war, and now the French, "strasse" giving place to "rue" and so on. We parked the car and had breakfast. At ten we discovered two flat tyres and removed to a garage. Buying maps of France and Belgium, we went to the Cathedral and looked on awhile during service. No statuary spoilt the lines of the pillars rising to the tall roof: the sun spilt through the wonderful stained glass to the stone floor, and the service proceeded with the same authority and dignity which it bore centuries ago, heedless of the gaping, guide-booked tourists who peered about and kicked chairs as they moved. We climbed to the spire of the Cathedral and surveyed the country for miles to either hand:

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with a map we chose our route from the city. At one o'clock we drove off, after taking some photographs of the old walls of the buildings near the canal. Having only a day and a half in which to reach Ostend, we drove at about 75 kilometres per hour over the hot straight road until delayed by a puncture at Nancy.

A few minutes were spent at Toul, a charming fortressed garrison town. Passing Bar le Duc, and leaving Dommartin on our right, we took to a second-class Roman road about nightfall which left Châlons to the left and headed straight for Rheims. The full moon rose over the cornfields and helped us to mend two punctures at ten-thirty, then still seventy kilometres from Rheims. Passing on just before midnight we made good going past two level crossings. The first was attended by its gateman, who was expecting the Paris express: the second was unlocked. But about two o'clock we came upon a third; we rang the bell without result; the man refused to leave his cottage; so getting tools from the car we laboriously took the locks from both gates, a long job since recent paint had glued the bolts and nuts. At length we were through and the locks replaced. Another flat tyre stared at us in reward, but Rheims was now twenty kilos. away, and the work was soon done. The last half hour's drive was a dull affair, for we had started twenty-two hours earlier and were both dead tired. Pulling up in a quiet street in Rheims we slept, one at the wheel and one in the back of the car. We had had many punctures during our journey, nearly all caused by the hobnails of peasants' boots, and it was noticeable that rain tended to wash them into the gutters and so diminish our difficulties.

At 5.30, after two hours dozing, we were at a garage having tyres and tubes overhauled after their damage from hobnails of the previous day's run. We felt that in few countries would such work be done at that hour on Sunday, and were grateful. After an hour at the Cathedral, torn by shell fire, we turned north-west to Laon, whose fortress on the hill could be seen for many miles. Passing on to La Fere and St. Quentin we saw many chalk lines in the fields where trenches had been filled. St. Quentin was not completely rebuilt: a large part of it was dust and scaffolding. A new memorial of the war had just been unveiled.

We bought some food and drove northwards through Fricourt, Roisel, Epehy and Gouzeaucourt. Near Roisel we stopped to look

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at a British and a German cemetery. Both were admirably kept, and lay sleeping in folds of land sheltered by woods. From now onwards we passed many British cemeteries, each neat and tidy, the graves surmounted by headstones bearing the regimental arms; except in the case of a few wooden crosses, mostly of German soldiers. Cornfields, woods and villages replaced the torn countryside of ten years ago, of which the only reminder were the half-grown trees, sprouting from the trunk like willows, an occasional fence made of mixed English and German barbed wire, an old Nissen hut, and painted directions on some of the older houses, such as "NACH CAMBRAI." Much of the brick building was of old material, so that the farms and cottages might have been of last century. Leaving Havrincourt and its stunted wood on our right we joined at Boursies the Bapaume—Cambrai road. Journeys that formerly took days were now being accomplished in minutes as we drove, and the country suddenly seemed small. Topping the rise once screened by camouflage we looked across the valley towards Bourlon Wood. Down below lay the Canal du Nord, unused and stagnant. The bridge by which we crossed was the one made by the Royal Engineers on 25th September 1918. The old bridge lay, a heap of bricks, by its side. After crossing we rose to the Hindenburg Line, dominating the country to its west. Dugouts and trenches had subsided; only rabbits now lived where men had previously burrowed. Passing Bourlon Wood on our left we bore right-handed into Cantaing, near the Canal de l'Escaut and south-west of Cambrai, stopping by a cornfield once a hell of gas and H.E. shell. Peasants stared from their Fords and farm-carts. The land was cultivated and peaceful; memories of war lived now only in history-books and village war memorials.

We passed along the line of the final advance, through Solesmes and across the Selle to the old fortress Le Quesnoy, besieged by New Zealanders on 3rd November, 1918. As we walked round the decayed ramparts we felt that perhaps there had been no great war after all: only little wars, for which these ramparts had been made. By this time it was three o'clock. On through Valenciennes and St. Amand to the Belgian frontier at Maulde. Already the people were changing; walking slowly, the men puffing pipes, the faces of people of the low countries replacing those of north-east France. At Tournai they were holding a pageant, with knights and armour

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and great white shaggy-heeled horses. The streets were hung with red, yellow and black. Going northwards we passed over abominable pavé road to Courtrai; for the first time we found the roads interfering with our comfort, trying the springing of the car at sixty kilometres speed. On each side were flat fields bounded by ditches, but the outlook was limited by the lowness of the road.

At Courtrai we turned left-handed along the straight road to Menin, where a funeral stopped us awhile. Soon the country lay open before us, explaining the security of the German position in the Salient. Woods were growing, and the road was hedged by new villas. Beyond Gheluvelt signboards bore names famous in history: cemetries multiplied, charabancs stood emptying and filling with battlefield visitors, and the Belgian train-tram screamed past, whistling as if to insist upon its nationality. Hooge lake was surrounded by growing trees and high corn, the property being enclosed by the Ypres League. Between it and the road were jerry-built villas.

The Menin Gate from Ypres had been opened lately. Sightseers hung about, and the pavements were littered with paper, dirt, orange-peel and faded wreaths. Charabancs reversed and vendors hawked souvenirs. The Gate itself is of good material desgined in the Wembley Exhibition style, the lion crowning the massive arch. The carving and guilding of the rolls of names of the missing has been well done. The arch itself seemed to us too wide for the street which leads to it, which appears to have been rebuilt to its former width.

It grew dark as we went into the town. The Cathedral was in scaffolding, and an ugly town-hall was building opposite the ruins of the Cloth Hall. We had dinner at a restaurant noisy with battlefield visitors, and left at 10.30. The roads were terrible, but with several halts for map-reading we made our way through Poelcappelle on to the Menin-Bruges road, which we struck at midnight. As soon as the lights of Bruges were in sight we halted, turned off the road into a wood, and made our beds down in a grassy field. I awoke from a nightmare to find a heavy boot on my chest. Never since childish terrors have I been so fiercely gripped by sudden paralysing fear. A tramp, wandering head down along the dark grass had stumbled over me, and now thrust his bearded face at me asking for money. Still obsessed by dreams I lay until

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roused by his desire to steal my best striped blanket: with difficulty he was shepherded past the car and stumbled off into the night muttering and spitting. Fortunately our long days and short sleeping hours enabled me to finish my four hours rest immediately; my companion never even wakened.

At five on Monday we drove into Bruges. Its grey town-hall with national flag was charming enough, but its canals seemed disappointing. Perhaps they are not at their best in the early morning. Swing bridges, moreover, checked us on leaving and delayed our final run to Ostend. We went northward to the sea-shore at Blankenberghe, turning west down the coast road along the sand dunes. Half way to Ostend it rained, and we reached the quay in a downpour at 9, finding that the boat left at 10.30. After a shave and wash, a hurried breakfast and business with money changing, we drove back to the boat, which my companion caught, being due in Edinburgh next morning for a promotion examination. Unassailed by punctures since Rheims we had been able to finish our journey as planned, seeing all that we had wished. Now, on return to the car, I found, after its 2,500 kilometre journey, that a lead from the distributor had severed. After two hours' work in the rain, and a visit to a garage with the parts which I had removed, I was compelled in the end to hire the municipal towing lorry, and went ignominously into dock, wet through and peevish. After instructions to the garage as to greasing, oiling and minor repairs, to be done by morning, I took a bag and repaired to a large hotel on the front, where I bathed and changed into clothes which had awaited the end of our journey. Only the morning's soaking could have made that bath and change the things they were, and the soft carpets of the hotel really appreciable. The pleasure of contrast stood out after twelve days' travelling with only six cooked meals.

Ostend was full of English trippers, boisterous and noisy. It was jarring to the nerves and made one think kindly of the Italian peasants and the clean mountain air. That evening friends came across to Ostend from England, and took the car next day once more across Europe, this time by Metz and Lucerne. She duly reached Cairo, rattling slightly but still efficient. For myself, I was glad to leave Ostend next day with its Englishmen on holiday . . . . The white cliffs of Dover were very welcome.

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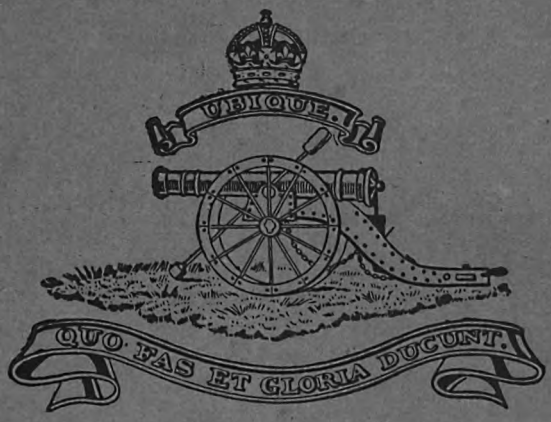

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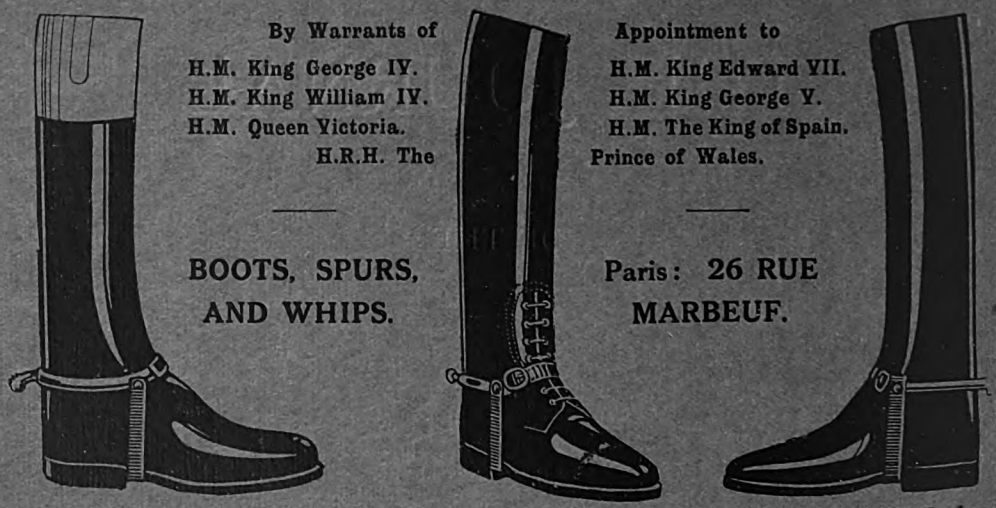

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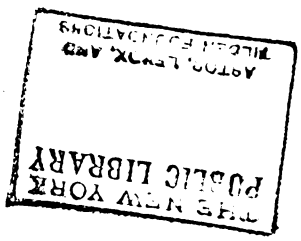

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LORD HORNE AS AN ARMY COMMANDER.

BY LT.-GENERAL SIR HASTINGS ANDERSON, K.C.B.,
MAJ.-GENL., GENERAL STAFF, FIRST ARMY, 1917-1918.

AS the years roll on, the natural revulsion of civilized peoples from the miseries and suffering of the Great War, and the general ignorance of anything but the main features of the great struggle which went on behind a veil of official secrecy, produce a tendency to forget the proud position occupied by the Armies of Great Britain and her Dominions at the close of the War, and to minimize the services and the qualifications of its outstanding military figures.

The reader of the obituary notices on the death of Lord Horne, who was not intimately acquainted with the details of the War in France, and with the characters of the British leaders, may well have wondered if silence at the head of a stationary Army, with the personal friendship of Earl Haig, and some claims to the invention and development of the creeping barrage, constituted in effect sufficient authority for his position and reputation as the leader of an Army. But surely the successful command of an Army during two years of arduous campaigning against the picked divisions of the great German Nation in Arms—of an Army which amounted often to no less than 500,000 men, with some 1300 guns—constitutes a claim to stand among the greater soldiers of our country. And it is strength of character rather than the intellectual attainments of the statesman or the writer, that nations have always sought in their military leaders. If intimate knowledge of men, determination, tireless effort, and steadiness of purpose, undeterred by the weariness of long waiting, and by reverses of fortune; and strengthened by a steadfast faith in God, and complete devotion to duty, are indeed qualities which we regard as a basis of the character of our great leaders, then Lord Horne need not fear to stand among the outstanding soldier figures of the Great War.

General Uniacke, in his article on Lord Horne which accompanied the October number of the "Journal of the Royal Artillery," has written as an old friend and emphasized the human side of

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Lord Horne's character. No one who has read it can doubt the value of his interest in hunting, polo, pigsticking, and sport, in the formation of his character as a soldier. I hope to recall the main features of his command of the First Army from September 1916 until the end of the War, and to emphasize his characteristics as its Commander.

Before September 1916, I knew Lord Horne by reputation only as a Horse Artillery General, who had established a reputation as a tireless fighting leader, trusted by his men in the 1914 Retreat, and who had continued to enhance that reputation, especially as the Commander of the XV Corps in the Somme fighting of 1916. In September of that year, the sudden illness of his senior General Staff Officer, took me to his Headquarters at Heilly at an hour's notice, to replace General Vaughan as Brigadier-General, General Staff to the Corps, on the eve of the battle of Guedecourt. Late in the evening I was introduced to the Corps Commander; I found a stern, reticent, soldierly-looking General, distressed by the sudden loss of a trusted senior Staff Officer, and anxious about the details of the impending attack, but calm, confident, and in no way fussing. A week later General Horne left to assume command of the First Army, with his headquarters at Lillers.

At the beginning of February 1917 I was ordered to join the First Army as Major-General, General Staff, to Lord Horne. The Vimy offensive was then fixed for the 15th March, in co-operation with Lord Allenby's Arras operations, and preparations were already well in progress. My first interview with Lord Horne was characteristic. He told me frankly that he had been anxious to get his old Brigadier-General, General Staff, on the Somme, as his senior Army Staff Officer, but on being told that other officers senior to him could not be passed over, he had asked for me, having known me for a short time on the Somme. He appeared to me typically a Highlander, suspicious of strangers, slow to give his confidence to those he had not thoroughly proved, reticent, and somewhat lonely in his high position, and very conscious of the great duties and responsibility which it imposed on him.

The Artillery General, Sir Frederic Mercer, and the Chief Engineer, Sir Gerald Heath, both old and tried friends, joined the

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Army Commander's Mess shortly after, and the arrival of Sir Geoffrey Twining, in relief of the senior Administrative Staff Officer, completed the immediate family entourage of senior Staff Officers who served the Army Commander in complete amity during the strenuous days of 1917.[1]

The Winter of 1916-17 was severe, and the frosts and thaws of early March 1917 made the preparations for the rearward services in the Vimy offensive particularly anxious. My recent experience on the Somme front in September and October 1916 enabled me to suggest certain measures, tactical and administrative, which appeared to be improvements in the plans for the battle, the main part in which, as in all the battles of the First Army in 1917 and 1918 was borne by the Canadian Corps, then commanded by Lord Byng. The German withdrawal to the Hindenburg line further south postponed the Arras offensive until the 9th April, and gave a welcome extension of time for the completion of essential preparations. The initial success of the Vimy offensive once assured, on the 9th and 10th April, General Horne seemed satisfied that his staff had proved themselves. It was his first great offensive battle as an Army Commander; the adverse comments of General Nivelle's staff officers on his plan of attack had added to the strain before the battle. He was in pain from a broken bone in his leg, caused by the fall of his horse on one of the muddy plank roads made by the Canadians up the rearward slopes of the Vimy Ridge. Yet his naturally strong and impulsive temper was always kept under iron control, and from that time until the end of the War, he gave to me, and to his other principal staff officers, his absolute and complete confidence. Such a gift from such a man was the greatest incentive to effort, the greatest reward to fruitful endeavour that experience has ever offered me. A man of marked nervous sensibility, and deeply conscious of his responsibility for the casualties caused by the operations under his orders, a light sleeper, ever fully alive to the implications of the booming of the German guns, and the dawn bombardments of the British attacks, he never once sent for me between 11 o'clock at night and 7 o'clock in the morning from the dawn of Vimy in April 1917 until the Armistice of the 11th November 1918.

[1] General Alexander, V.C., succeeded Sir Frederic Mercer later in the year.

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The lack of success of General Nivelle's operations, overheralded and discussed in Paris before their commencement, compelled the continuation of the Arras—Vimy offensive by the British Third and First Armies throughout April and May. The advance of our infantry trenches into the Douai Plain beyond the Vimy Ridge brought fresh problems of observation and artillery support, but in spite of casualties and disappointments, steady progress was made, and during the Summer, Lens was gradually invested more and more closely.

The attachment of the Portuguese Corps to the First Army added further anxieties for General Horne. The methods and training of our Allies differed materially from those of the British Army, and their national pride made their assimilation in the British front a matter of anxious thought and difficulty. It was on crutches from his Vimy accident that General Horne inspected the Portuguese troops which first took over a portion of the line between Neuve Chapelle and Festubert in May 1917.

Early in June, Lord Haig was able to transfer his main operations to Flanders, where the Messines battle formed a prelude to the later Passchendaele offensive, designed to free the Belgian coast from the German naval and military menace to the Channel Ports, and the essential communications of the British Armies in France. The Commander-in-Chief's orders to the First Army Commander were to continue operations on the Vimy—Lens front with his reduced effectives in such a way as to deceive the Germans opposite his Army as to the move north of the British main effort. General Horne ordered the Canadians to continue their advance on the Souchez River and round Lens, and he organized schemes for the mystification of the German Commanders opposed to him. On the 25th June, while the attack on Lens was pushed forward, a First Army Horse Show was held on the high ground some eight miles behind the front trenches. Some risk there was, and the question of the presence of Army Nursing Sisters and of French ladies was anxiously discussed. But the converging motor traffic to the scene of the show, the concourse of spectators, and the reinforcement of the observation balloons in the air above, were well calculated to give the impression to the enemy that a concentration of troops for a more determined pressing of the Lens offensive was in pro-

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gress. Three days later the impression was confirmed by more practical operations. Just before dark and favoured by a heavy storm of thunder, lightning and rain, a heavy bombardment on a front of 15 miles from north of Lens to Oppy heralded feint attacks at various points, with real attacks resulting in progress on a two-mile front astride the Souchez River towards Lens, entry into Avion, and the capture of 2000 yards of German trenches near Oppy.

The Press had not been taken into the confidence of G.H.Q. as to the real meaning of the First Army Commander's measures, and their effect was, to a great extent, marred by the publication of articles referring to the covering of minor operations by so great a bombardment as verging on a practical joke.

About a month later, the situation opposite Lens was so far favourable that Lord Horne submitted plans for its capture with five Divisions, supported by some 70 tanks. The success of such an operation appeared secure, and the effect of such a success, moral perhaps rather than practical, on the Army and on public opinion, both French and British, encouraged him to hope that the operation would receive sanction. But Lord Haig was anxious to conserve his troops for the northern operations, and the Canadian Corps, which formed the essential bedrock of the scheme, were to be required later in Flanders. And so the Army Commander accepted his disappointment, and the operations round Lens were restricted to limited corps operations which by the end of August, resulted in its almost complete investment on the north, south and west. With the departure of the Canadians in October 1917 for the Passchendaele offensive, active operations on the First Army front died down, and with reduced effectives, and Divisions cut down from 12 to 9 battalions by reorganization forced on the Commander-in-Chief by shortage of man power, Lord Horne turned from offence to defence, and prepared on a long 40-mile front to meet the threatened German Spring offensive, which the Revolution in Russia and the defection of her Armies, rendered practically a certainty.

Before the end of the year, the Canadians returned to the First Army from the Passchendaele battles. As the Spring of 1918 approached, and the signs of a German offensive grew more threatening, the hardening of the ground on the Neuve Chapelle—

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Givenchy front, due to the continual trench-draining of the last four years, added to a dry Winter, made Lord Horne nervous about the safety of the northern section of the line, where the Portuguese troops were widely extended, fatigued after long periods of trench duty with little relief, and with many of their officers absent in Portugal.

The bursting of the storm further south on the 21st March 1918, and the consequent move of divisions to reinforce and relieve the Third and Fifth Armies made it impossible for the Commander-in-Chief to allot British divisions for the relief of the Portuguese. On the 28th March a heavy fresh German assault from Douai threatened the Vimy Ridge from the south and the French coal-fields round Lens, but the attack was beaten off after heavy fighting by the Southern divisions of the Army. The threat had been serious, and the danger to the remaining coalfields of France had caused anxious queries from the French to Lord Haig as to the capacity of the First Army Commander.

The concave shape of the Army front, some 45 miles in length, and the conformation of the road system in its rear rendered command difficult, and seemed to forecast a retreat into the Second Army Area to the north of the Northern divisions of the First Army, if forced to withdraw by a German offensive. The line was held by the Portuguese and by battle-weary divisions from the Third and Fifth Armies new to the Army front. But it was not until the 8th April that arrangements could be made by G.H.Q. for a transfer of the Northern divisions to the command of Lord Plumer, and for the relief of the Portuguese by British divisions, already much reduced by fighting in the battle further south. The very next morning, before these measures could be carried out, the German Lys attack fell on the Portuguese front, and the line was forced back on a ten-mile front, exposing the flanks of the Divisions to the north and south. The 55th Division stood fast in Givenchy on the south; and Armentieres on the north, smoked and gassed by the Germans in spite of the presence of French inhabitants, was slowly evacuated, but the attacks spread to the north to the Second Army front, and a deep salient was driven in on the British front.

On April 11th, Lord Haig published his famous clarion call

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to the British troops: "With our backs to the wall and believing in the justice of our cause each one of us must fight to the end." The German attacks died down and the front was stabilized by the third week in April. It had been an anxious time, and German shells actually fell on the First Army Headquarters. A rear Headquarters was prepared some 15 miles west of Ranchicourt, where Lord Horne had been quartered ever since the Vimy advance just a year before, and all was ready for a move back, but, convinced of the value to the moral of his Army of his remaining in his forward position, he refused to withdraw; and his determination to remain was rewarded. There he stayed until the advance in the following Autumn allowed him to move forward. That he was the only British Army Commander who was not forced to withdraw from his headquarters by the advance of the enemy was always a source of pride to him and to the troops he commanded.

During May and June, no fewer than five schemes were prepared under Lord Horne's direction for a counterstroke across the La Bassee Canal towards the north, to recover the Lys front, but the Germans in the salient were already suffering heavily from the concentric fire of the British artillery, and Lord Haig, with his forces reduced to 45 effective divisions, and with the IX Corps again attacked on the Chemin des Dames in co-operation with the French, was not in a position to spare the inevitable casualties of such an operation. Local counter operations alone were therefore undertaken on the First Army front, and no important change of front occurred during the Summer months. The Canadian Corps was jealously guarded by Lord Haig as an effective reserve, and the Canadian Divisions were taken out of the line in turn for a month's rest and training. At the beginning of August, this Corps moved south, under conditions of great secrecy, to join Lord Rawlinson's Fourth Army, so as to take part in the Allied offensive of the 8th August east of Arras. About the same time, the Germans, finding their position on the Lys untenable under the fire of the British artillery, commenced to withdraw from the salient formed by their April offensive.

The Amiens battle spread north, and on 21st August it extended to the Third Army in the Bapaume offensive. The Canadian Corps, released from the Fourth Army front, rejoined the First Army,

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and going into line again on its southern front round Arras, was ready on the 26th August for the further extension north of Lord Haig's offensive in the battle of the Scarpe. From then until the capture of Mons on Armistice morning, the First Army was continually engaged, with the four strong Canadian Divisions, each containing 12 battalions, as its main source of offence, and Lord Horne was to prove, if proof were necessary, that he was indeed no mere silent commander of a stationary army.

On the 2nd September, the Quéant—Drocourt line was forced, in co-operation with the Third Army. This successful storming of a northern extension of the formidable Hindenburg line was effected by a happy combination of artillery and infantry tactics which made it peculiarly gratifying to Lord Horne, and it was perhaps his greatest victory. Following these operations, the Canadian Corps and part of the XII Corps south of the Scarpe advanced close up to the Canal du Nord, preparations for the crossing of which were at once commenced. A few days later, the Army Commander received orders to take such action north of the Scarpe as would lead the enemy to anticipate attack on a large scale on this front, and to draw off his reserves from the main scene of operations. Lord Horne accordingly issued orders for the troops north of the Scarpe River to prepare for attack on a large scale. Tanks and infantry were trained in co-operation in localities where they could be observed by hostile planes, additional balloons were put up, reconnaissance of the whole front between the Scarpe and the La Bassee Canal was carried out by officers of the Cavalry Corps and Tank Corps, artillery registration was carried out by single guns and sections in advanced positions, wire cutting and patrolling were carried out systematically, forward dumps were formed and additional casualty stations were erected; everything was done to give the Germans the impression of impending attack. Our own troops soon suspected that the attack was only camouflage, and Lord Horne in consequence "postponed" the attack, but his skilful manœuvres had produced their effect, the enemy showed every sign of nervousness, and reinforced his front north of the Scarpe, neglecting the danger south of the river. When the attack on the Canal du Nord came on the 27th September, of the 21 German Divisions facing the First Army, 13 were immediately

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disposed to meet the attack north of the Sensee Canal, and only eight (three in the line and five in reserve) were immediately available opposite the real front of attack.

There is no space in a short article to describe the successive stages in the First Army's final advance, the forcing of the Canal du Nord; the advance on Cambrai; the withdrawal of the Germans from Lens and Douai; the battle of the Selle, the capture of Valenciennes; and the final advance and capture of Mons on the morning of the Armistice, 11th November 1918. The difficulties of the First Army operations in September, October, and November, are best described in General Horne's own words:—

"The strategic plan decided upon by the Allied Commanders-in-Chief was—Americans and French, converging attack on Mezieres; British, converging attack on Maubeuge; Belgian and Allied Forces in Flanders, converging attack on Ghent. Sir Douglas Haig's decision was to deliver his main attack with the Fourth and Third Armies, the primary rôle of the First Army being to cover the left flank of the Third Army. To carry out efficiently the duty of protecting the left flank of the Third Army it was necessary to attack and dislodge the enemy on that flank. It was made clear to me that the number of divisions and the amount of artillery available for the First Army were limited, that I could expect no increase, and that I must carry out the task as best I could with what I had at my disposal. I mention this in order that it may be understood that it was not from choice, but from necessity, that the First Army attacks during the period 26th August to 27th September were delivered on so narrow a front, and with an exposed and ever lengthening flank. This flank rested, to begin with, on the strongly organized position of the Vimy Ridge garrisoned lightly enough by the VIII Corps, none too strong in numbers, and strung out on a long front. As operations progressed this flank gradually extended along the line of the River Scarpe, the Trinquis brook and the Sensee marshes, until at one time, the 12th October, it attained to some 15 miles. Parallel to this flank and south of it, at a distance from the enemy positions of from 3 to 6 miles, ran the Arras—Cambrai road, the main line of communication and supply of the right of the First Army. It may fairly be said that such a situation entailed considerable risk, and I admit it:

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but as a matter of fact the risk was not so great as it appears at first sight. The Trinquis brook and the Sensee marshes—obligingly flooded for us by the Germans—rendered attack in force very difficult. The chief danger was that German guns would interfere with the road: but the German Commander was evidently imbued with the idea, in which we encouraged him, that an attack on him was imminent north of the Scarpe. For his own protection, therefore, he flooded the marshes and withdrew his guns to extreme ranges from the crossings. This left the main road in comparative peace. We on our part employed our artillery in strength in the protection of this flank, carrying on very active counter-battery work. I am ready to admit that this flank was a source of anxiety, and the provision of troops for its protection added to our difficulties."

As First Army Commander Lord Horne had the satisfaction of ending the War with the capture by the Canadian Corps of Mons, from which he had withdrawn in August 1914 as the Commander of the Artillery of the I Corps. At 5.30 on the morning of the 11th November 1918, when the news of the signing of the Armistice was brought to me, the Canadians were still reported to be on the outskirts of the town, and at 7 o'clock, when in accordance with routine on days of battle, I went to report to the Army Commander, no further reports had been received, and communication with the front line troops was temporarily interrupted. It was with supreme satisfaction that the news was received by the Army Commander at breakfast at 8.30 o'clock that Mons was in our hands once more, $2\frac{1}{2}$ hours before the fighting came to an end, and peace once more reigned in Europe.

It must always be difficult to appraise the military merits of Commanders of Armies in France; the time has not yet come to view the operations in true perspective, and especially is the task of weighing the reputation of a Commander not one to be attempted by a staff officer who has served in intimate and confidential relations under him. An Army Commander held no independent Command, the fronts and flanks of Armies were rigidly tied down, the Army gains were won by hard frontal fighting, almost as mechanical as the movements of a parallel ruler: the art of strategy was almost completely denied to their operations, and these were of necessity methodical rather than brilliant.

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Limited by these considerations, further restricted in almost all his operations by limitations of effectives, frequently finding his plans postponed or negatived by the requirements of other fronts, Lord Horne's two years of Army Command provide a record of steady calculated success in offence, and of quiet determination and resolute thwarting of the enemy in defence. The just fame of the Canadians who were throughout his command the backbone of the First Army, and the prominence rightly given by the Canadian press to their prowess, tended to obscure the part played by Lord Horne as an Army Commander in directing, guiding, and combining with the work of other Corps, the operations in which they participated.

Those who as staff officers have served Commanders, trained and untrained in the details of staff duties, will appreciate what often appeared to be the advantages of Lord Horne's ignorance of staff work. His regimental training had given him an intimate acquaintance with the soldier, and sufficient realization of the importance of administration, and of meticulous care in preparations, tactical and administrative. His outlook was the outlook of the open air man, his body and mind trained by long years of field sports. He had studied his profession in the field, and its theory with careful but not meticulous application. He knew what he wanted, his decisions were sound, crisp and reasoned, and once given they were adhered to; the detailed execution was left to his staff, and that staff, once proved in his estimation, were given the fullest trust and confidence, and knew that whether results were favourable or unfavourable, honest endeavour would receive full backing. He was not robust, and the exertions and strain of command told upon his constitution; but he was fully alive to the importance of his own physical fitness, and he kept himself keen and hard, he ate little and drank nothing; once a heavy smoker, he had reduced himself to one cigarette a day after dinner, and one on going to bed. Whenever possible he rode, and his great delight was to send horses some ten miles from home to meet his car on return from some official visit, and to ride home hard across country. The graceful easy seat of the hunting soldier was his to perfection, and the memory of his clean-cut, soldierly figure, on a well-bred horse striding across the fields will dwell for long in the recollection of those who served in the First Army.

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Whatever operations were in progress he went to bed at 11. Punctually at 7 every morning, during periods of active operations, I went to his room and reported the results of the night and early morning, as far as they were definitely known to us. In this way, he was spared many of the indefinite reports of success or failure which always marked the commencement of an attack, with the resulting alternation of elation and depression. To any who experienced the hopes and fears which were the lot of those who served at superior headquarters in the days of the great battles in France, such a detail will convey, better than long description, the iron control of a great leader; and the trust and confidence which he aroused in those who served near him.

Lord Horne had the stern unbending sense of duty which marked men of the type of the Duke of Wellington, of Sir Patrick Grant or of Stonewall Jackson. He was impatient of indiscipline, of slackness, of eyewash, and especially of a lack of care in Commanders for the lives and the comfort of their men. He was essentially of the Royal Regiment. A slack trace, men lounging on their horses at a halt, or horses across the road, when he passed a battery on the march, would bring him bounding from his car, with quick sharp words to the officers, which taught many that the eye of the Horse Artillery Commander had not dulled with rank and age.

Above all, he was a man of deep religious sentiment. To him, as to Stonewall Jackson, may be applied the words of Colonel Henderson: "In whom shall we find a firmer faith, a mind more humble, a sincerity more absolute? He had his temptations like the rest of us. His passions were strong, his temper hot, forgiveness never came easily to him. Fearless, strong and self-dependent, he was the very model of a Christian gentleman."

Long may the British Army continue to breed such leaders.

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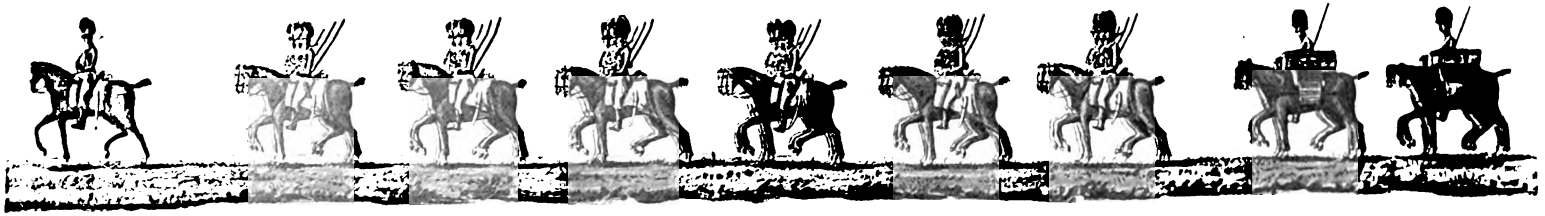

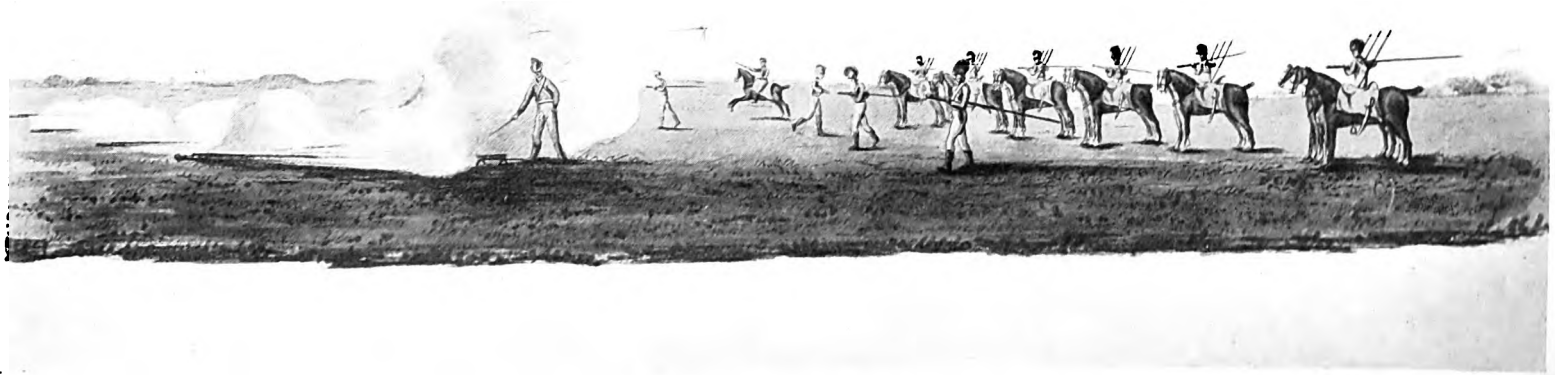

A Rocket Troop 1814.

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THE ROCKET SERVICE AND THE AWARD OF THE SWEDISH DECORATIONS FOR LEIPZIG.

By Captain H. B. Latham, R.H.A.

THE publication of Army Order No. 112 of 1901, granting to "O" Battery, R.H.A., the right to carry on the traditions of the 2nd Rocket Troop, R.H.A., caused a somewhat acrimonious correspondence in the pages of this Journal.

It is with no desire to reopen the controversy that this article has been written; but rather to attempt to give a coherent account of the formation and early actions, in which the various detachments of the Royal Artillery, "employed in the service of Rockets", took part, between the years 1813 and 1816.

This would scarcely have been possible but for the recent very careful research work carried out by Major E. W. H. Fyers, whose grandfather, Lieut.-Colonel Peter Fyers, C.B., commanded the Royal Rocket Brigade, R.H.A., in 1816.

In addition, through the very kind assistance of Lieut.-Colonel Allan Uggla, the Swedish Military Attaché in London, the complete list of all the officers and men of the artillery, who received a Swedish decoration for the Leipzig campaign, is now published for the first time.[1]

Before going any further, a brief description of the rocket itself is essential, in order to understand the results that were achieved by its use in battle.

Congreve's Rocket system.

To many of us the word "Rocket" conjures up only memories of childish festivities on November 5th. But to a man like Congreve, who received a monthly allowance from the Navy Office "as preparing stores for the annoyance of the Enemy" it meant far more.

Though he had been experimenting with rockets for many

[1] See Lt.-Col. J. H. Leslie's article on these decorations in the "R.A. Journal," Vol. XL No. 7.

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years, it was not until 1805 that Congreve received any official encouragement. At first it was considered that the rocket was only likely to be effective for the sea service, where the towering masts and huge spread of canvas of the warships of the day offered a very suitable target to such an inflammatory weapon as a rocket.

On turning his attention more seriously to the land service, he quickly realised that he had invented one of the best "close support" weapons ever devised. He laid it down as a maxim, "that the very essence and spirit of the Rocket System is the facility of firing a great number of rounds in a short time, or even instantaneously; with small means; arising from this circumstance, that the Rocket is a species of fixed ammunition, which does not require ordnance to project it, and which, where apparatus is required, admits of that apparatus being of the most simple and portable kind." [1]

Briefly his idea was to put a shell in the front end of a rocket, which was powerful enough on being fired to transport itself and the shell through space for any required distance, according to the elevation at which it was fired.

He eventually evolved a rocket of sufficient power to carry a 42 lb. shell to a range of 2000 yards,[2] but at the time with which this article deals, the most common types to be found in the land service were the 32 pr. and the 12 pr.

If we remember that the Horse Artillery gun of the period only threw a 6 lb. shell, we shall be able to appreciate more fully Congreve's invention, which without any gun at all, carried a shell of double the weight the same distance, with only slightly less accuracy.

And from the following history we shall find, that on nearly every occasion on which they were used in war, the noise and visibility of their approach, the heavy casualties and ghastly wounds that they inflicted,[3] struck terror into troops who were not unaccustomed to endure without flinching the shell fire of the period. But their effect was to a large extent neutralized by the very brief

[1] "The details of the Rocket System" by Colonel William Congreve, published in 1814.

[2] Drawings exist of an 8″ Rocket weighing nearly three hundred-weight; but I cannot find that these were ever used.

[3] They set alight to the clothing of the wounded.

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period of training which the "Rocketeers" had undergone previous to having to handle them in battle.[1]

In September 1811 Congreve's experiments had so far impressed the Board of the Ordnance, that they placed at his disposal a detachment from the Horse Artillery at Woolwich commanded by 2nd Captain Richard Bogue[2] and consisting of one N.C.O. and 30 men.

Formation of the 2nd Rocket Troop, R.H.A.[3]

His experiments now continued both at Woolwich and Bagshot until the middle of May 1813, when a select committee of artillery officers reported that "they were unable to offer any opinion as to their utility and recommended that a trial should be made with them upon actual service."

The Master-General of the Ordnance concurred in this recommendation and Bogue's unit was warned accordingly.[4]

By this time the original small detachment had grown considerably. Lieut. Thomas Strangways[5] had joined it in October 1812, and now with the order to proceed on "Active Service" immediately, it was granted the right to style itself "The Rocket Brigade" [6] and was still further augmented, so that when it embarked at Ramsgate on June 11th "in the three very fine transports *Antelope, Stag* and *Royal Oak*" it consisted of :—[7]

2nd Captain	Richard Bogue.
1st Lieut.	Amherst Wright.
,,	Thomas Strangways.
Assistant Surgeon	Beard.
Staff Sgt.	Thomas Hill.
Sgt.	James Wright.

[1] The Rocket Brigade, afterwards the 2nd Rocket Troop was the only unit that had had much training in the handling of rockets in peace.

[2] Bogue, one of the handsomest men of his day and a great friend of the Prince Regent, had served through the Corunna campaign with "B" Troop, R.H.A.

[3] The 2nd Rocket Troop did not assume this title until January 1st, 1814.

[4] P.R.O. W.O. 47/2631.

[5] Afterwards, Brigadier T. Fox-Strangways, killed at the battle of Inkerman whilst commanding the artillery with the army—"His long silver hair and the full dress jacket that he always wore made the veteran of Leipzig and Waterloo a conspicuous figure in the army, while his brave and gentle nature endeared him to his own regiment." ("History of the Royal Artillery," Crimea Period; by Jocelyn.).

[6] Authorized by R.W. 7 June, 1813.

[7] A small party consisting of 1 corporal, 1 Bombardier, 1 collar-maker, 13 gunners, 4 women and 2 children, embarked at Woolwich on the 7th June in the transport *Diana*.

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5 Corporals, 5 Bdrs., 3 Farriers, 2 Col. Makers. 1 Wheeler, 1 Trumpeter, 82 Gunners, 24 Drivers, 8 officers' chargers and 97 troop horses.

Europe in 1813.

Bogue's Rocket Brigade sailed under orders to join the "Army of the North," commanded by the Crown Prince of Sweden.[1] To understand how this came about, a brief survey of the state of Europe at this time is essential, since with the exception of the 73rd Foot, no other British troops were sent to North Germany at this time.

Napoleon had invaded Russia in 1812, and after one of the most disastrous retreats known to history could only muster 30,000 disorganized men in January 1813 out of the well-equipped army of 450,000 with which a few short months before he had started the campaign.

The pursuing Russian army, which had suffered almost as severely as the French, advanced slowly into Poland when the King of Prussia issued a call to his subjects to rise and throw off the heavy yoke of France. Sweden joined the coalition and all north-eastern Europe flew to arms. England poured in money and equipment, for apart from helping to equip the new Prussian Landwehr, so easily mustered owing to the foresight of Stein and Scharnhorst, she had nearly 20,000 foreigners on her pay-roll before August. Only Austria stood aloof and she, under the able guidance of Metternich, only bided her time to break with the French.

Napoleon by means of prodigious efforts had concentrated early in 1813 an army of 170,000 men on the line of the Elbe. The Allies, including the fiery Blucher at the head of his Prussians, were driven back at Lutzen and Bautzen and an armistice, which both sides needed badly to prepare for the coming struggle, was entered into in May and lasted till August 10th.

Bernadotte at the head of 25,000 Swedish troops had landed at Stralsund, and having both Russian and Prussian corps placed under his command, was busy organizing the "Army of the North" in the vicinity of Berlin and Brandenburg.[2]

[1] Charles Jean Baptiste Bernadotte at one time one of Napoleon's marshals.

[2] Total strength of the Army of the North was 60,000 men.

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He immediately detached Lieut.-General Walmoden's Corps, which consisted of a very mixed collection of Russian and German units mostly in the pay of England to watch Davout, who with a large army based on Hamburg, was threatening his right flank.

The "Rocket Brigade" landed at Wismar in the province of Mecklenburg, on August 8th, and joined Walmoden's Corps on the 23rd, remaining in or near Schwerin. On the 7th September Bogue marched with half his brigade to join the main army,[1] leaving Strangways to follow with the remainder on the 27th. Before this happened, however, the "Rockets" had been in action for the first time.

Battle of Göhrde, September 16th 1813. (Map "A").

On September 12th Walmoden learnt from an intercepted despatch that Davout had ordered General Pécheux to cross the Elbe with 7500 men and 8 guns to clear his communications with Magdeburg. He decided to try and cut off this detachment and by the 14th had concentrated at Domitz 2800 cavalry, 5000 infantry, 28 guns and half the Rocket Brigade.[2]

Crossing the Elbe that night he reached Dannenburg by nightfall on the 15th with Tetterhorn's Cossacks out in front as far as Dahlenburg in touch with Pécheux's troops. By mid-day on the 16th the Cossacks had been driven back onto the head of the main body near Göhrde castle. Walmoden then discovered that the bulk of the French force was drawn up on Steinker Hill with their right resting on Oldendorf, their left near Luben and their front protected by the marshy ground stretching through Pommoissei to the Elbe. Deciding to attack immediately he gave Arentsschildt an hour's start and despatched him with a cavalry regiment,[3] 6 battalions and a battery to move via Rothen and attack the French right.

He ordered the remainder of the infantry and two batteries to advance straight up the Göhrde—Oldendorf road covered by

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[1] Near Wittenberg.

[2] Dornberg commanded the cavalry, whilst the infantry were under Arentsschildt and Lyon. The 73rd Foot were the only British Infantry Regiment present.

[3] 1st Hussars of the Russian German Legion.

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the Cossacks, whilst Dornberg with the remainder of the cavalry and artillery was to move via Dubbekold to attack the enemy's left.[1] The position of all the troops at 4.15 p.m. is shown on Map A.

Pécheux, as soon as he realized that he was faced by stronger opposition than the light troops he had been led to expect, began to retire. But since he himself was out in front with his advanced troops at the time, a certain amount of delay took place in the initiation of this movement. This gave time to Arentsschildt to launch his attack and the French troops being shaken by a well-executed charge of the 1st Hussars, his infantry quickly overpowered all the troops opposed to them and occupied Oldendorf and Eichdorf.

The fight in the centre was much more stubborn. Dornberg had brought the allied artillery and rockets into action at too great a range, their fire was thus ineffective and Lyon's attack was held up.[2]

The French, however, now began to retire formed in squares, so that Dornberg was enabled to bring his guns across the marshy ground, whilst Strangways brought the "Rockets" into action "close under the fire of the enemy's infantry." [3]

The 3rd Hussars now charged most gallantly and Lyon's infantry returning to the attack, the enemy's rearmost square was broken, and the fugitives carrying disorder to the other squares which had formed in rear to support them, these also broke, and soon the whole French force was retreating in disorder.

The Allied infantry advanced only as far as Nahrendorf, when Walmoden at about 7.30 p.m. handed over the pursuit to the Cossacks and withdrew the remainder of his troops to Göhrde castle for the night.

The Allies at a loss of 550 had inflicted 1500 casualties on Pécheux's force and had captured 2000 prisoners and 8 guns.[4]

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[1] The Rocket Brigade accompanied this column.

[2] One stray rocket pitched amongst Arentsschildt's infantry (over 2000 yards range) causing a certain amount of confusion.

[3] *London Gazette*, 1813, No. 16784—Walmoden's despatch.

[4] The Rocket Brigade only lost two horses in this engagement.

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The Congreve rockets which were used here for the first time in battle showed themselves to be very unreliable, but the few direct hits they scored made such an impression on the French that Davout attempted to produce the same weapon for himself through a Danish source.[1]

After the battle of Göhrde, Strangways marched on the 27th with his half of the Rocket Brigade and rejoined Bogue on the 30th September.[2] But whilst Walmoden had been busy checkmating the almost incomprehensible movements of Davout great events had taken place.

Austria had joined the Allies on the termination of the Armistice since when Napoleon, though he had been victorious at Dresden, had found that his lieutenants could make no headway against the Allies, for they had been defeated at Gross Beeren, Dennewitz and Wartenburg. In October, therefore, he decided to concentrate at Leipzig and to crush his opponents' main army under Schwartzenburg which was advancing towards the Saale to sever the French communications.

For a short time after its arrival the Rocket Brigade formed part of Bulow's Corps, then taking part in the siege of Wittenberg;[3] but on October 2nd it was attached to the bodyguard of the Crown Prince under the command of Colonel Lievitson (Stedinck's Swedish Corps) "with the understanding that on days of action it was to be more at liberty than that corps and subject only to the directions of Captain Bogue." [4]

Napoleon's decision brought on the "Battle of the Nations" lasting from October 16th—19th, which ended in the total defeat of the French with the loss of 60,000 men and 300 guns.

The Battle of Leipzig, October 16th—19th 1813.

Napoleon by the 14th had concentrated 190,000 men and 700

[1] "Geschichte der Nord Armee"; by Tafeln.

[2] Lieutenant Charles Poten of the 7th Line Battalion, King's German Legion, served with the Rocket Brigade at Leipzig, being the only officer of the Legion present in that action. He was appointed by Walmoden to conduct the Rocket Brigade to the Grand Army in Saxony.

[3] Wittenberg finally surrendered on January 15th, 1814.

[4] Letter from Lieut. James.—"R.A.I. Proceedings," Vol. XXIV.

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guns. He did not consider it possible that Blucher could arrive in time to make his presence felt on the north of the city and so decided to concentrate the whole of his force against Schwartzenburg's Army of Bohemia in the south.

It was largely due to the fact that Bernadotte was unwilling to meet his old master, that the Army of the North was still lagging behind Blucher's left flank and took no part in the battle till the 18th.

On the 16th the Allies attacked in the south and fighting raged furiously around the villages of Liebertwolkwitz, Markleeberg and Connewitz. Napoleon's plans had, however, been disarranged by the arrival of Blucher in the north which necessitated the detachment of Marmont's and Souham's corps to check his advance, so that when night fell, the French, though still holding the majority of their original line, had lost Markleeberg.

The losses on both sides had been terrific, but the heroic gallantry of the young allied levies boded ill for Napoleon in the future. The 17th was spent by both sides in reorganizing, though Blucher attacked and drove Marmont behind the Partha. Napoleon during the night withdrew his troops in the south to the line shown in the sketch.

On the 18th the opposing armies faced each other along the circumference of a vast semi-circle resting on the Elster, both south-west and north-west of the city, Bennigsen's Army did not come up into line till about mid-day, whilst that of the Crown Prince was not fully deployed till 3 p.m.

At 7 a.m. the Allies again attacked furiously in the south, but could make no impression on the stubborn defence of the French, until Bennigsen coming into action on the right carried Holtzenhausen. He however failed to make any impression on his northern flank against Paunsdorf until the leading troops of the Army of the North came to his assistance. Early on the 18th Bogue had obtained permission to join Winzingerode's cavalry which was leading the Crown Prince's advance, and had been granted a squadron of Dragoons as escort. The Rocket Brigade thus appeared on the field soon after 3 p.m., in time to take part in the second attack on Paunsdorf. Just before their arrival and just north of where they were now to come into action, the whole

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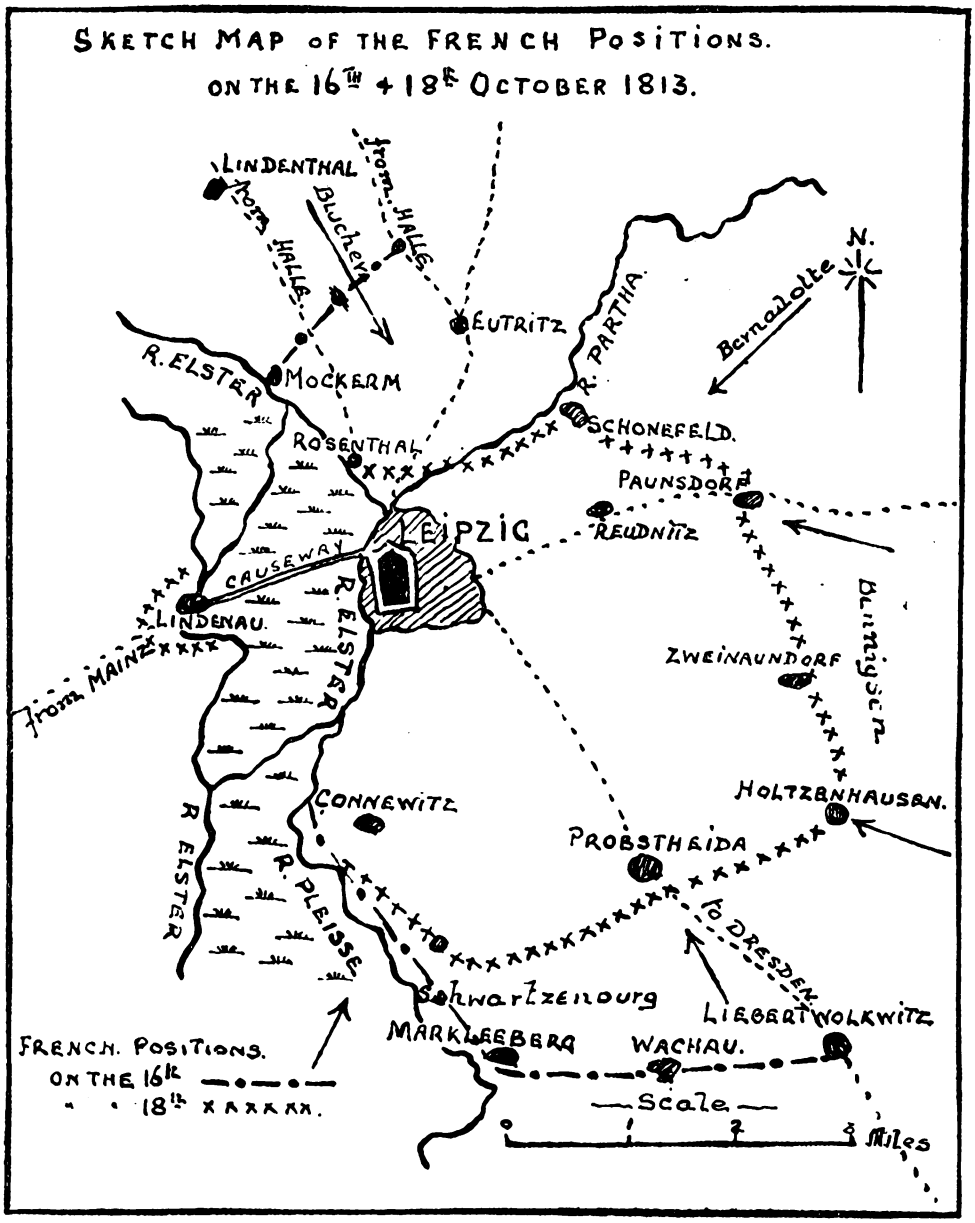

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of the Saxon army had come over in a body to the Allies, leaving only Durutte's five weak battalions to defend Paunsdorf. And though Ney had ordered forward another division[1] to support this remnant of Regnier's Corps, the Allies seized the chance to deploy all the artillery of the advanced guard and renew the attack on the already shaken French. The fire of the Rocket Brigade was so accurate owing to the very short range at which Bogue brought them into action, and their effect so astonished the French that they very soon began to evacuate the village in some disorder. Seeing this Bogue placed himself at the head of his escort and charged into the village. There was, however, still plenty of fight left in the French and Bogue and his small force were being driven out of the village, when Strangways brought the Rocket Brigade up in close support. After this all resistance ceased and 2500 French surrendered.

Bogue was now ordered to take his Brigade forward to attack the village of Sellerhausen and had scarcely arrived within range of this place when he was struck in the temple by a bullet and killed instantly.[2]

Strangways now took command of the Brigade[3] and brought it into action with such effect against the village that this place was also taken by the Allies. But they were driven out again by a counter-attack, and with the light failing and the arrival of Napoleon himself at the head of his "Old Guard," no further success was achieved in this part of the field. Further to the north, however, Blucher had forced his way into the suburbs of the town, and during the night the French commenced their retirement across the Elster.

At 2 a.m. on the 19th the French rearguards fell back to organize a defensive position in the suburbs of the city itself, but the Allies did not move forward to the assault until 7 a.m. When they did attack, however, all was soon over, though the troops under Macdonald and Poniatowski put up a desperate resistance. The confusion inside the town itself was indescribable and when

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[1] Delma's Division.

[2] He was buried in Taucha cemetery.

[3] Only for the remainder of the battle. Lieut. Wright was the senior and though away on the 18th, took command of the Brigade on the 19th.

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the only bridge across the river was blown up prematurely by the "sapper" in charge nothing remained but to surrender. Both Marshals attempted to escape by swimming, and though the former got away the latter was drowned. The Rocket Brigade took no part in the actual assault of the town.[1]

So ended the Battle of Leipzig in the disastrous defeat of the Emperor at a loss to the Allies of about 45,000 men. In addition to Bogue, the Rocket Brigade lost 1 driver killed, 6 N.C.O's and men wounded and 26 horses.[2]

For their gallantry on the 18th the Brigade received the thanks of the Crown Prince, and in General Orders (Artillery), dated May 16th 1815 appeared the following :—

> "His Royal Highness the Prince Regent in the name and on behalf of His Majesty has been pleased to Command that the Rocket Troop of Royal Artillery which was present at the Battle of Leipzig be permitted to bear the word 'Leipzig' on their appointments in commemoration of their services on that occasion."

After the Battle of Leipzig, the Rocket Brigade marched with the Army of the North in pursuit of the French until Mulhausen was reached on October 28th. Here the Crown Prince swung his army round and marched northwards through Hanover to attack Davout who was gradually driven back and finally besieged in Hamburg. During these operations the Brigade took part in the sieges of Fredericksfort and Gluckstadt which surrendered on December 13th 1813 and January 5th 1814 respectively, and again received the thanks of the Crown Prince.

On January 1st 1814 it assumed the title of "The 2nd Rocket Troop, R.H.A.," and on the 18th it received orders to join the force under the orders of Sir T. Graham in Holland. On the 21st, in company with the two Horse Artillery Troops of the K.G.L., it crossed the Elbe on the ice near Bremerverde and arrived at Sevenbergen (Holland) on March 6th. It stayed in the Netherlands until the Waterloo campaign, so here we may leave it and see how the 1st Rocket Troop was formed.

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[1] Bogue was buried on this day the whole brigade attending.

[2] P.R.O. W.O. 55/1196, Page 124. Lt. Wright's despatch.

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Formation of the 1st Rocket Troop, R.H.A.

From these events taking place in Germany we must return to affairs in England and to the theatre of war in which she was most interested, namely the Peninsula.

Here Wellington, on the flood tide of victory after the battle of Vittoria, was advancing to the siege of St. Sebastien, which was not finally captured till September 9th 1813. Soult was despatched by the Emperor to restore the shattered fortunes of France, but he also was driven back after fierce fighting in the Pyrenees, and the British Army was quartered on French soil for the winter. The authorities at home, thinking that Wellington would show less reluctance to use rockets against French cities than he had against Spanish, decided on the formation of another unit "trained in the service of Rockets." [1]

Captain Ilbert's Company of the 5th Battalion, R.A., which was at Woolwich at this time was the unit selected, though its commanding officer himself was at the time on his way back from Canada.[2] Both officers and men appeared to have undergone very little, if any, training in the handling of their new arm, when the company was warned for active service on about September 27th 1813.

Lane's Detachment.[3]

The Company embarked at Woolwich on the transport *Marshal Wellington* on October 3rd, consisting of the following, all surplus N.C.O's and men having been previously attached to Lieut. P. D. Stewart's Adjutant's Detachment at Woolwich :—

2nd Captain	H. B. Lane.
1st Lieut.	John Crawley.[4]
2nd ,,	Ewan Morgan.
Sgt.	James Lindsay.

4 Bdrs. and 50 Gnrs.

The transport was delayed at the Downs for some time, whilst

[1] P.R.O. W.O. 6/145.
[2] Captain Ilbert died at Valenciennes, 14 Jan., 1816, after a very brief illness.
[3] Though the Muster Rolls show that the Headquarters of the Company accompanied Lane, the letters, etc., of the period always refer quite wrongly to his unit as a "Detachment."
[4] Crawley embarked at Portsmouth and rejoined at the Downs on the 10th.

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the destination of the detachment was decided. Eventually, however, it disembarked at the port of Passages (in northern Spain) on about the 14th November and marched to Urrugne (3 miles S.W. of St. Jean de Luz), where it joined the army under the Duke. It had taken no horses with it and its lack of training in the handling of its new weapon did not impress Col. A. Dickson at all favourably.

Before briefly narrating the exploits of Lane's unit in Southern France, it is necessary now to tell of the formation of yet another rocket detachment, for soon after Lane had sailed it was decided that another company armed with rockets was to be despatched with the force then being got ready to sail under Sir T. Graham to Holland. Captain Eliot's Company of the 5th Battalion, then at Ringmer and Eastbourne, was selected. Colonel Congreve, however, pointed out that there were already in Woolwich some 19 N.C.O's and men trained to use rockets and suggested that if Captain Eliot brought one subaltern and twelve men to Woolwich to join those already there, this would form a sufficiently large detachment to handle the rockets with the force they were going to join.[1]

This it was decided to do, and Eliot's company was for the time being broken up, whilst he proceeded with his selected men to Woolwich on December 8th for a fortnight's training.

The Prince Regent now decided that it was time to put the Rocket Service on a proper footing, to avoid the necessity of breaking up established units of the Royal Artillery, and in General Orders dated 18th and 24th December 1813 appeared the following:—

> "He was pleased to approve of an addition of a Lieut.-Colonel and two Troops to the Establishment of the Royal Artillery to be attached to the Service of Rockets" . . . .

And

> "The Two Troops to serve with Rockets are to be attached to the Horse Artillery . . . .[2] They are to be mustered by the Adjutant of the Horse Brigade of the 1st January

[1] P.R.O. W.O. 55/642, page 317.

[2] This was necessary, since all the men of Bogue's Troop were Horse Artillerymen.

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next. The detachment going out under Captain Eliot and that serving in the Peninsula under Captain Lane are to be formed into one Troop and the detachment under Lieuts. Wright and Strangways are to be considered the other."

On the appearance of these orders we find that Captain Ilbert and Captain Eliot's companies of the 5th Battalion were reformed, whilst Lane's detachment was mustered into Eliot's Troop and shown as "detached in France." All the officers were given their "Jackets" with the exception of 2nd Lieut. Morgan[1] who was transferred to Captain Trelawney's Company in the Peninsula and Eliot's Troop became known at the 1st Rocket Troop, whilst Bogue's old Brigade became the 2nd Rocket Troop, R.H.A.

Eliot embarked with his men at Deptford on December 26th and after being delayed at Harwich by severe weather, disembarked at Hellevoetsluis on February 16th 1814 and marched to Willemstatt.

Lane's Detachment in the Peninsula.

During the winter of 1813, Wellington took the opportunity to organize his army into three main columns. The western column was commanded by Sir John Hope, and Lane's detachment formed part of it. Lane had been busy during this period training his men and organizing his unit, with such success that though Colonel Dickson had reported on January 2nd "that he couldn't help noticing how little attention had been paid to the instruction of those intended to use it (i.e. rockets) whom Captain Lane informs me were only instructed to the use of the implement three days previous to embarkation."[2] Still by February 8th when Wellington came to inspect their practice with rockets, the results were fairly satisfactory.

When operations recommenced, Sir John Hope gradually drove back the French opposed to him into the entrenched camp of Bayonne, and was then ordered by the Duke to cross the Adour between the city and the sea on the 23rd February and complete the investment of the garrison.

[1] Second Lieutenants were not allowed in the Horse Artillery. He remained however attached for duty to Lane's detachment.

[2] P.R.O. W.O. 55/1196, page 160.

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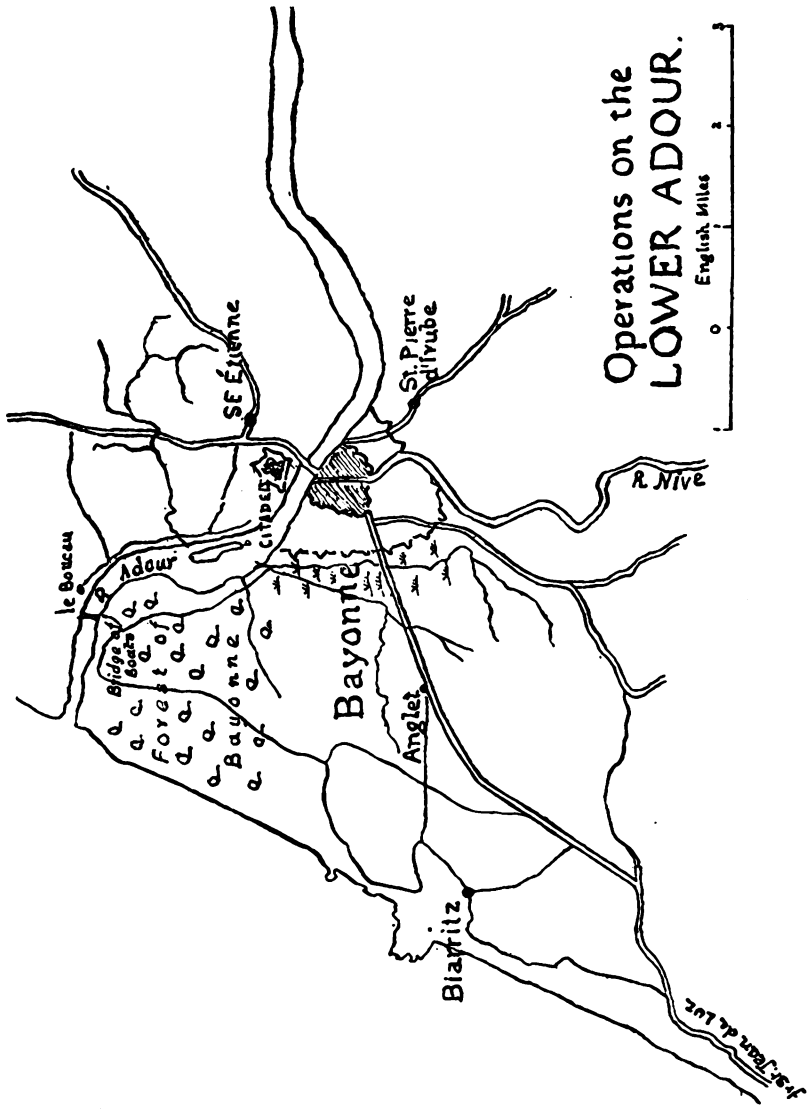
Hope moved up his force in two columns, Lane's detachment accompanying the 1st Brigade of Guards and the 18 prs.



Early next morning the rockets and 18 prs. were brought into action on the bank of the river against the north-western end of the French entrenchments. They had scarcely opened fire when

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at about 9 a.m. the French naval flotilla[1] moved down to attack them. They were, however, quickly driven away by a few rockets, one of which hulled a gunboat. The British fleet, failing to appear with the Spanish boats[2] with which the bridge was to be built, Sir John Hope was forced to ferry as many men across the river as he could in the few pontoons he had available. In this he was so far successful that there were some 500 men with Lane's Rockets on the right bank before nightfall.

Just as it was getting dusk, the French attacked this small force with two battalions.[3] Lane posted his men in advance of the British line and as the French advanced full of confidence "a few Rockets thrown into the midst of the dense columns, spread such consternation amongst their ranks that facing about they retreated in the greatest disorder. The men of the Rocket Brigade followed and now the extraordinary scene presented itself of a strong body of infantry flying before some dozen assailants. But the new and formidable weapon with which they were armed had struck terror into the enemy and they did not stop until they had reached the citadel, while 25 of their body, the greater part badly wounded, fell into the hands of the enemy." [4]

"Altogether this was a great day for the Rocket Battery, and Hope was fain to admit that, when the range was short, rockets were effective on enclosed ground or on water, though very uncertain when used with any elevation." [5]

The investment of Bayonne was completed by the 27th February.[6]

Whilst these events had been occurring near the coast, Wellington with the remaining two columns of his army defeated Soult at Orthes on February 27th and occupied Bordeaux on March 12th.

Lane's detachment now joined the main army under the Duke

---

[1] The French Corvette *Sappho* and 12 gun boats.

[2] The current of the Adour was too swift to allow of pontoons being used for bridging.

[3] The 27th and 87th Regiments.

[4] "History of the King's German Legion" by Beamish.

[5] "History of the British Army." Vol. X; by Fortescue.

[6] Bayonne was never captured. The French made a successful sortie on April 14th and wounded and captured Sir John Hope and his staff. The news of Napoleon's abdication was officially communicated to the besieged on April 27th.

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and advanced with it to the attack of Soult's position outside Toulouse.

Battle of Toulouse (Map "B").

Wellington approached Toulouse on March 26th to find Soult occupying the town itself and a line of redoubts on the heights of Calvinet to the north-east of the city. After some preliminary moves which came to nothing Wellington left Hill facing the suburbs of St. Cyprien with the Light Division at Seilh in support and crossed the Garonne with the remainder of his army at a point about 14 miles down stream of the city on the 5th and 8th April.

By nightfall on the 8th his cavalry had seized the bridge over the river Hers at Croix Daurade and he intended to attack Soult on the 9th, but the bridge which was to have been relaid near Seilh was not completed and the attack was postponed till the 10th. All the troops were on the move by 3 a.m. on that day and by 8 a.m. the situation was as follows. The light Division which had crossed the Garonne and Picton's 3rd Division were demonstrating against the bridgeheads of Minimes and Jumeaux respectively. Hill had attacked the suburb of St. Cyprien and had quickly driven the defenders back to the actual ramparts of the city, whilst Freire's Spaniards advancing astride of the Albi road had seized La Pujade hill.

Beresford with the 4th and 6th Divisions had commenced his daring march across the enemy's front early, with his left flank protected by Vivian's Cavalry Brigade[1] moving parallel to his column on the other bank of the Hers.

His march, however, was so interfered with by the heavy state of the going, that his column got very much strung out, his guns could not keep up[2] and he was late in beginning his attack. At 11 a.m. Freire, who was to have synchronized his attack with that of Beresford, could wait no longer and launched his Spaniards against the Grand Redoubt.

[1] Now commanded by Major von Gruben, Vivian having been wounded on the 8th.

[2] The artillery with the army was disposed as follows:—

With Sir Rowland Hill.	Capt. Bean's Troop, R.H.A., and Capt. Maxwell's Bde.
,, Picton and Alten.	Capt. Turner's Bde.
,, Freire.	Ten 9 prs. Portuguese Artillery.
,, Somerset.	Capt. Gardiner's Troop, R.H.A.
,, Bereford.	Capt. Brandreth's Bde. Capt. Daniel's Bde., K.G.L. Capt. Lane's Rocket Detachment.

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His columns were, however, attacked in flank as they advanced and thrown into confusion. The Spaniards being driven back in disorder were unfit to take any further part in the action for two hours.

In spite of this and of the fact that his movements were plainly visible to Soult, Beresford pushed on until he reached the Caraman road. Here he deployed facing west and advanced to attack La Sypière, at about mid-day. Soult launched Rey's Brigade against the British as they were forming. But as the counter attack bore down on them Lane brought his rockets into action and "some well-directed rockets whose noise and dreadful aspect were unknown before[1] threw the French into confusion," and they retired followed by the British until Beresford halted his men on the line "A"—'A' to await the arrival of his artillery.

There was now a lull in the battle till 2.30 p.m., though Picton, contrary to orders, attempted to storm the bridge of Jumeaux without success. At this hour the Spaniards again assaulted the Grand Redoubt only to be again repulsed, while Beresford attacked Mas des Augustins, still without his artillery. By 4 p.m. he had captured both the Calvinet Redoubt and Mas des Augustins and his guns had joined him on top of the ridge. The French withdrew from the Grand Redoubt unmolested at 5 p.m. and retired to the suburb of St. Etienne, the British following up but making no effort to attack them again. This was the end of the battle, for Soult slipped out of Toulouse on the night of the 11th through the suburb of St. Michael on his way to Carcassone, and early on the 12th the messengers arrived from Paris with the news of the Armistice.[2]

England, having assisted to bring the war in Europe to a successful conclusion, now turned her attention to America where the war had been dragging on in a desultory fashion along the Canadian border and on the lakes. It was decided to reinforce the garrison there from the troops then in the South of France and

[1] "English Battles and Sieges in the Peninsula"; by Lieut.-Genl. Sir William Napier.

[2] Lane was struck by a spent shell, during the battle, and received the Peninsula Gold medal "as commanding the Rocket Troop at Toulouse".

Lieut. Morgan, Gnr. T. Beadson, Dr. W. Potter — Received the M.G.S. medal with clasp for Toulouse. Potter belonged to the Corps of Drivers and was attached to Lane's detachment.

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to fit out an amphibious expedition to attack Washington and to employ rockets with this expedition.

At this time, as we have seen, Eliot's 1st Rocket Troop was at Willemstatt in Holland, with 2nd Captain H. B. Lane, Lieut. J. Crawley and 51 other ranks detached in Southern France; whilst the 2nd Troop to which Captain E. Whinyates had been posted on March 26th but which he had not yet joined,[1] was at Sevenbergen, also in Holland. Both Troops had for the moment been placed under the command of Eliot.

Since it appeared that it would take a considerable time to get Lane's detachment back from Southern France it was decided to recall both Rocket Troops from Holland and to employ one or both of them on the American expedition.

Eliot's Troop accordingly embarked on or about the 18th May and returned to Woolwich, but without Eliot, who was away at Nieuport and didn't rejoin his troop till after the 3rd June. Whinyates' Troop marched to Ostend on the 14th August, but finding no transports suitable to take the horses, marched to Bruges to await their arrival. The order for them to embark was, however, countermanded on about September 6th and they remained in Holland to take part in the Waterloo campaign of the following year. The authorities in England thus had only the half of Eliot's Troop which they could lay their hands on for the American expedition, and this unit at this time contained several N.C.O's and men who were dissatisfied with the Rocket service and none of the men had had any experience in handling them in battle. The arrival of Lane's detachment in July[2] was thus very opportune, and it was decided to include his detachment in the troops then preparing for the "Lesser" Expedition.[3]

Lane marched from Woolwich on 22nd August and embarked at Portsmouth in the *Mary* (450 tons) transport with the following men, etc. :—

2nd Captain	H. B. Lane.	Asst. Surgeon	Gibbons.
1st Lieutenant	J. Crawley.	Sergeant	Edward Howe.

[1] Whinyates joined on April 30th.

[2] Lane's Detachment left Toulouse about June 3rd.

[3] Expedition against New Orleans.

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2 Corpls., 1 Bdr. and 32 Gunners, with 400 32 pr. and 100 12 pr. rockets.

Sailing via Madeira and Barbadoes, they arrived off Cat Island on December 1st.

No attempt will be made here to recount the doings of Lane's detachment in the attack on New Orleans since a very full account of this disastrous campaign, with the most excellent maps, compiled from the private papers of Col. A. Dickson, the C.R.A. of the force, is at present appearing in the Journal of the Society for Army Historical Research.

Lane's detachment rejoined the 1st Troop at Woolwich in July 1815.

The Waterloo Campaign.

The 2nd Rocket Troop was still in the Netherlands when Napoleon escaped from Elba and landed near Cannes on March 1st 1815.

Since an account of the part played by each unit of the Royal Artillery in the Waterloo campaign has already appeared in this Journal,[1] the following account of the part played by the Rocket Troop has been compiled as far as possible so as to include only fresh facts which have recently come to light.

The Troop, whilst still at Berghe, was made up to strength in April by the arrival of a draft of 20 men and 30 horses, and Whinyates was eventually allowed by the Duke to take into the field 800 rockets as well as his six guns. It must be remembered, however, that the gun detachments were at the same time the rocket personnel and thus both types of equipment could not be handled simultaneously.

On the concentration of the Army being ordered the Rocket Troop together with the other R.H.A. Batteries arrived too late at Quatre Bras to take any part in the engagement. But on the 17th June Whinyates, contrary to the orders he had received, kept his troop in rear to assist in the retirement of the cavalry. His troop

[1] The British Artillery at Waterloo; by Capt. A. F. Becke. Vol. XXXIV, No. 7, "R.A. Journal."

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came into action for the first time in the campaign on the rising ground just north of Genappe, when some rockets were fired down the chaussée at a pursuing French Battery.[1]

The Troop spent the night of the 17th in an orchard adjoining a wheelwright's shop on the western side of the road to Brussels and about half a mile north of the farm of Mont. St. Jean.

On the 18th when the army took up its position, the Troop moved southwards and halted on the right of Ponsonby's Cavalry Brigade ('A' on the map) where it remained until the cavalry moved forward to take part in the charge which caused the defeat of D'Erlon's Corps.

The Troop also advanced, but instead of following the cavalry it moved straight to its front and, having unlimbered its guns at 'B' and left them in action, the rocket detachments moved forward down the slope to 'C' where several volleys of rockets were fired up the slope towards the Grand Battery. This took place at about 2.30 p.m., and though Whinyates thought the effect of the rockets was rather stifled by the high and sodden crops, an English officer who was lying wounded in the French position heard them passing overhead and heard the French cavalrymen cursing them and swearing that "the English were trying to burn them alive." [2]

It is interesting also to note that Whinyates' horse, whilst galloping down the slope to open fire, nearly trod on a French "Eagle" which was lying on the ground close to the dead man who had carried it into action. No one stopped, however, to pick up this prize and it must have been retrieved by the French again later in the day.

Whinyates must have retired to his guns again and brought these into action by about 3 p.m., but soon afterwards on the British line retiring slightly, he conformed and brought his guns again into action at 'D' where they remained for the rest of the action.

At about 5.15 p.m., however, Dansey[3] was detached to the

[1] See account of this in "Mercer's Diary." Mercer was largely responsible for the rockets being fired on this occasion. A stray one appears to have chased him.

[2] British Museum. Waterloo letters—Lt. Ward's account.

[3] The following officers served with the Troop at Waterloo :—

Captain E. C. Whinyates.	1st Lieutenant A. Wright.
2nd Captain C. C. Dansey.	1st Lieutenant T. Fox-Strangways.

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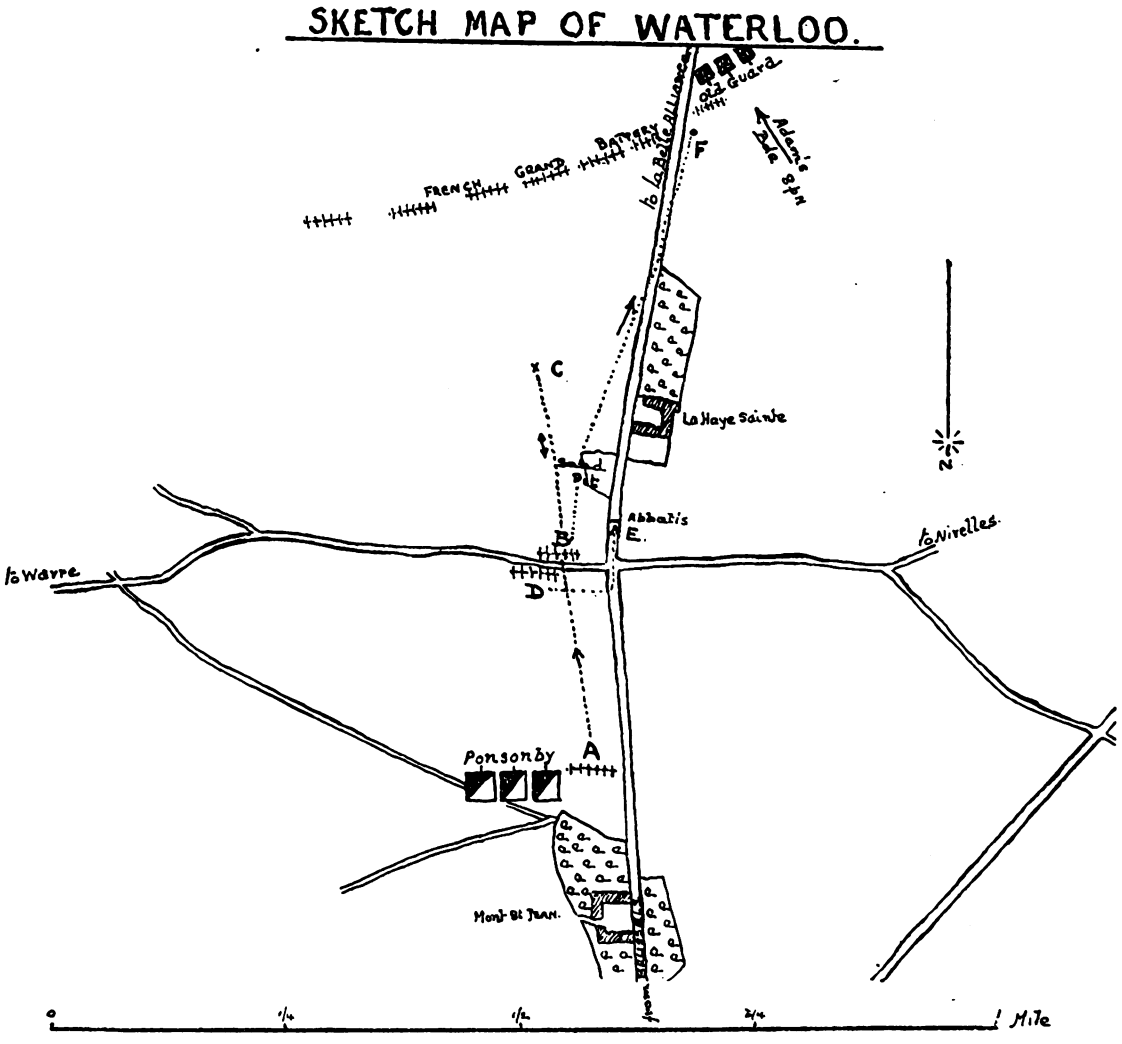
right to assist in the defence of La Haye Sainte. He found it quite impossible to take guns down the main road, and so parking these in rear of the crest he went forward with his men dismounted and armed with rockets. He and Lieut. Wright (both mounted) were hit as soon as they reached the abattis across the road at 'E', and



the command of the detachment devolved upon Sergeant Daniel Dunnett. This N.C.O. behaved most gallantly under a very heavy fire of musketry. He laid out his rockets and opened fire on a strong French column advancing to attack La Haye Sainte from the

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south-east and checked its advance until all his rockets were expended, when he rejoined his guns in rear of the crest.

When the British line advanced at the end of the day the Rocket Troop also moved forward and came into action near La Haye Sainte[1] against one of the squares of the "Old Guard" which Napoleon had formed up near the Grand Battery to try and arrest the panic-stricken retirement of his army. These squares had driven off Vivian's cavalry but with the arrival of Adam's Brigade and with three[2] batteries of British Artillery which fired grape shot into them at a range of 60 yards, they also were ordered to retire by the Emperor.

The Troop, which had fired 309 shot, 236 spherical case, 15 common case and 52 rockets during the battle, bivouacked for the night in the vicinity of La Belle Alliance.

Of the officers present with the Troop on the 18th, Whinyates had had three horses shot under him and had been wounded in the leg and in the left arm. He did not rejoin until after Paris had been captured. Dansey had been shot through the left shoulder, whilst at about 5.30 p.m. Strangways had received a terrible wound, a round shot breaking his thigh and injuring his spine. Some of his men attempted to carry him to the rear, but he implored them not to, saying "Do not move me, let me die by my guns."

Wright was the only officer not wounded and he was badly bruised, a bullet having ripped off the buttons of his jacket. In addition to the above the Troop lost 1 corporal, 1 bombardier, 4 gunners, 1 driver and 24 horses killed and 2 bombardiers, 12 gunners, 18 drivers and 3 horses wounded.

The Troop marched with the Allied Army to Paris[3] and on the declaration of peace formed part of the "Army of Occupation," being billeted at Bezons. On the reduction of the Army in France, it returned to England and proceeded first to Warley and then to Woolwich.[4]

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[1] At 'F' on the sketch.

[2] Whinyates and Gardiner's Troops, R.H.A., with Rogers' Field Bde., R.A.

[3] Via Etreillers, 26th June, and Chenevière, 1st July.

[4] Landed at Woolwich, January 31st, 1816.

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The reduction in the Rocket Service in 1816.

On the 4th July 1816 His Royal Highness the Prince Regent, in his name and on the behalf of His Majesty, signified his pleasure "that under the existing circumstances, the Brigade of Royal Horse Artillery be reduced to eight Troops . . . . and the Rocket service be reduced to one Troop . . . ." [1]

It has generally been accepted that on this order being given the 2nd Rocket Troop was reduced, though no mention was made in it definitely naming the 2nd Rocket Troop. A careful examination, however, of the Muster Rolls and Artillery Letters preserved in the Public Record Office only tends to throw great doubt on the statement made by Major Duncan in his "History of the Royal Artillery," Vol. II, page 37.[2]

That a certain amount of care was taken in "naming" the Troops for reduction is obvious from the fact that "I" Troop[3] was not disbanded at this time, largely on account of its very fine fighting record in the Peninsula. It would therefore be illogical to assume that the same authority that had saved "I" Troop would reduce the 2nd Rocket Troop with its battle-honours of Leipzig and Waterloo in order to keep a junior Troop with a much poorer war record.

It may be said that the Muster Rolls when examined to-day, portray the result of Orders no longer preserved. These leave no doubt as to what the authorities desired, viz. :—That whatever the surviving Rocket Troop was to be called in the future, the traditions, etc., built up by the 2nd Rocket Troop were to be preserved and it was not to be reduced. This is quite clear from the way in which the reduction was carried out in July 1816. It would appear that this mistake as to which of the Rocket Troops was reduced was largely due to the fact that troops at this period were more commonly known by the name of their commanding

[1] P.R.O. W.O. 55/1164. There were 12 Troops, R.H.A., at this time, of which "I" (Bull's), "K", "L", and "M" Troops were the junior being formed in 1805.

[2] See also page 394, Vol. I. Major Duncan appears in doubt as to which Troop was disbanded.

[3] "K", "L", and "M" Troops were disbanded. Whilst "D" was reduced in place of "I".

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officer (e.g. Eliot's Troop) rather than by any letter or numeral. Eliot, being senior to Whinyates, was appointed to command the surviving Rocket Troop. But that he fully realized that this was not his own troop (i.e. the 1st) is apparent from the August Muster Rolls, when he shows himself as transferred to the 2nd Rocket Troop.

Briefly what happened to the two Rocket Troops was as follows. In January 1816 the 1st Troop mustered 5 officers and 84 other ranks.[1] By July 1st it had, however, been so reduced that it could only show a strength of 5 officers and 33 other ranks, and during this month every single officer and man was transferred to the 2nd Troop or elsewhere. In other words it had ceased to exist.

The 2nd Troop having returned from France in January with a strength of 5 officers and 191 other ranks, still mustered in July 107 other ranks.[2]

The August Muster Roll, i.e. the first Muster Roll of the surviving Troop is the important one, and a glance at this shows that practically all the men and officers were those that belonged to the 2nd Troop the month before. The officers are:—

Capt. W. G. Eliot	(1st Troop)
2nd Capt. C. C. Dansey	(2nd ,,)
Lieut. A. Wright	(2nd ,,)
Lieut. T. F. Strangways	(2nd ,,)
Lieut. J. T. Fuller	(from "K" Troop)

and in the space provided for alterations during the month we find:—

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[1] The establishment of a Troop, R.H.A., in England at this time was 5 officers and 94 other ranks.

[2] In the part of the July muster roll showing the alteration during the month, Captain E. C. Whinyates and Lieut. F. Ward are shown as transferred to the Corps of Artillery Drivers, 14 N.C.O's and men are shown as transferred to various other units, whilst 4 are pensioned. In the muster roll itself, the other ranks are bracketed and shown as "Transferred to Eliot's Troop." This appears to have been done by some other hand than that which prepared the Roll, probably a pay clerk.

The men not accounted for above were mostly "on command" etc., some of them being away with Lieut. Fuller, taking part in the expedition against Algiers.

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"Increases."

Joined.	Captain W. G. Eliot	from 1st Rocket Troop, 1st August.
	Lieut. J. T. Fuller	,, "K" Troop.
	11 Other Ranks	,, 1st Rocket Troop.

"Decreases."

Captain W. G. Eliot	to 2nd Rocket Troop, 1st August.
Lieut. W. Smith	to "B" Troop.
2nd Captain W. Miller	to Corps of R.A. Drivers.
Lieut. H. R. Wright.	,, ,, ,,
Lieut. A. Ward.	,, ,, ,,
10 Other Ranks	to Adjutant's Detachment.
11 ,, ,,	to 2nd Rocket Troop.
7 ,, ,,	Discharged.
6 ,, ,,	on Command, etc.

Note.—The "Decreases" shown above dispose of the whole of the 1st Rocket Troop. The "Increases", however, only show the 11 other ranks which actually came across from the 1st Troop. Lt. Fuller had taken nineteen N.C.O's and men with him on the expedition against Algiers.

From the foregoing it is quite clear which of the Rocket Troops was reduced. If only this August muster roll had been put, as it should have been, with the other muster rolls of Whinyates' Troop, the mistake would never have occurred and the publication of Army Order 112 of 1901 would have been unnecessary.

We have seen also that Lt. Fuller and 19 other ranks had proceeded on the expedition against Algiers. As this is one of the few occasions when any part of the regiment took part in a naval engagement, it merits a rather fuller description.

The Bombardment of Algiers, August 27th, 1816. (Map "C").

For some years past Algiers had been the centre of a piratical gang of cut-throat Turcs and scoundrels from the Levant, and her fleet which had reached considerable proportions was used almost exclusively in raiding the local shipping and selling the captives as slaves. This state of affairs was brought to a head on May 23rd 1816, when the crews of the coral fleet were massacred whilst

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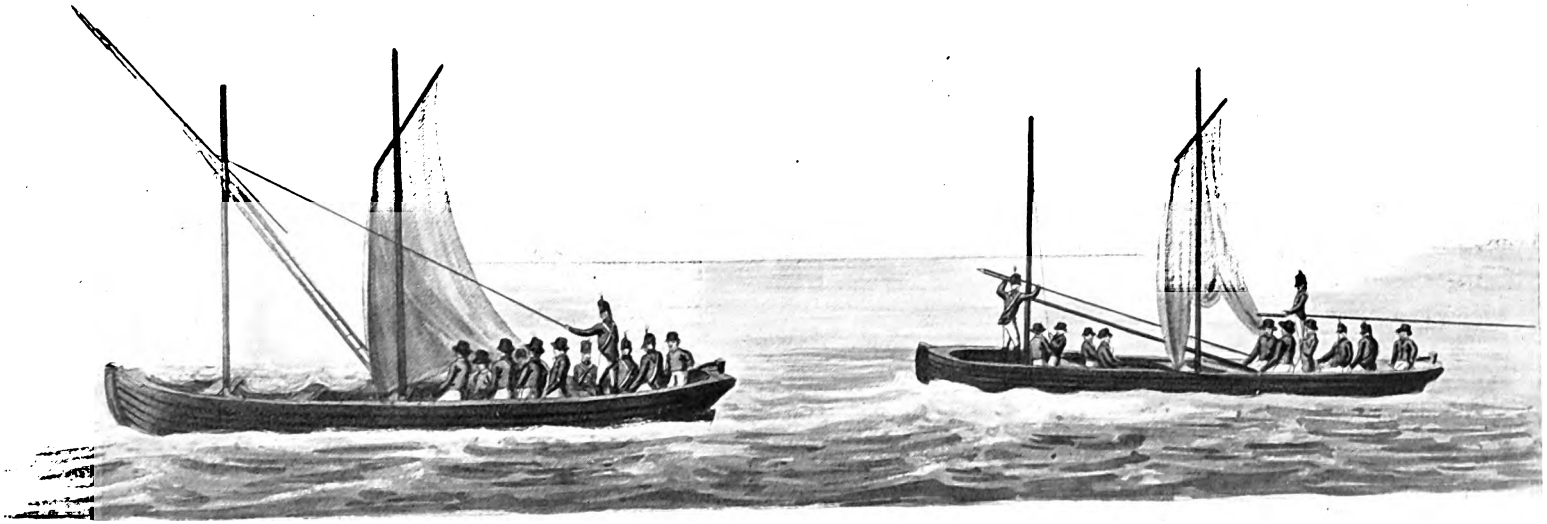

ROCKET BOATS 1816.

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attending Mass at Bona. England immediately decided to stamp out once and for all what had become an absolute pest and Holland agreed to assist.

A fleet of some six ships of the line and four frigates was fitted out and placed under the command of Lord Exmouth who was ordered to exact vengeance upon the Dey by bombarding Algiers into submission. In view of the nature of the expedition it was considered that the inclusion of rockets would be advantageous and 2500 were loaded in the transport *Trafalgar* to accompany the fleet. To actually handle these in action a detachment from the Rocket Troop then at Woolwich which consisted of the following, was detailed to accompany the expedition :—

Lieut. J. T. Fuller.
19 other ranks.

The main body of the fleet left Portsmouth on July 25th and arrived at Gibraltar on August 9th. Lieut. Fuller sailed in H.M.S. *Impregnable,* but his men were split up amongst the various men-of-war and transports.

During the week that the fleet remained there, the Dutch squadron of five frigates under the command of Admiral von Capellan joined. The flotilla, which consisted of the following boats, etc., was then organized and the crews told off :—

5 Gun Boats	(obtained at Gibraltar).
10 Mortar Boats	(launches belonging to the fleet).
8 Rocket Boats	(flats ,, ,, ,,).
32 Gun boats	(barges, yawls, etc.).

The whole of this flotilla was placed under the command of Captain F. J. Michell, R.N., and the rocket boats, with which we are chiefly interested, were divided into two divisions, one of which was commanded by Fuller and the other by Lieut. J. M. A. Stevens, R.M.A.

This necessitated the transference of some of the men of the Rocket Troop to other ships, which was carried out on August 12th, and meant that when this reorganization was completed the men of the Troop were to go, or rather sail, into action in the following way :—

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TABLE SHOWING THE DISTRIBUTION OF THE PERSONNEL OF THE ROCKET TROOP AMONGST THE ROCKET BOATS FOR THE ACTION.

Rocket Flat	*from*	
No. 1.	H.M.S. *Queen Charlotte.*	Gnr. John Gordon. ,, Abraham Tonks. ,, Daniel McCleod.
No. 2.	H.M.S. *Impregnable.*	Nil.
No. 3.	H.M.S. *Superb.*	Sgt. Richard Thompson (killed). Gnr. James Spotswood. ,, William Easton.
No. 4.	H.M.S. *Albion.*	Bdr. Peter Washbrooke. Gnr. John Cavanagh.
No. 5.	H.M.S. *Minden.*	Lieut. J. T. Fuller. Sgt. Edward Howe.[1] Gnr. John Barnard Gnr. William Howarth.[1] ,, James P. Beeby. Driver William Weatherhogg.
No. 6.	H.M.S. *Granicus.*	Gnr. Michael Barnes (wounded). ,, Joseph Allen (wounded).[1]
No. 7.	H.M.S. *Leander.*	Gnr. William Culverhouse (wounded).[2] ,, Richard Rhodes.[2]
No. 8.	H.M.S. *Hebrus.*	Gnr. James Hoyle (wounded).[3] ,, John Thomas (wounded).[3]

Note.—Each Rocket flat was under the command of a midshipman and in addition to the above, carried a crew of about eight sailors.

The Allied fleet sailed on August 15th (many of the gun boats having to be towed) and arrived off Algiers early on the 27th.

A flag of truce was immediately despatched to the Dey with terms which amounted practically to a surrender of the fortress, and when these were refused the fleet made sail and followed the flagship, H.M.S. *Queen Charlotte,* into the bay, the Dutch squad-

[1] Received the Naval General Service Medal with clasp for Algiers.

[2] Only transferred to the flat of the *Leander* for the action. Travelled to and from Algiers in the *Minden.*

[3] Transferred to the *Queen Charlotte* after the action.

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ron being detached to engage the defences on the eastern side to prevent the fleet coming under a cross fire.

Algiers was at this time most strongly fortified and garrisoned. There were upwards of 300 guns mounted in the well-built casemates and in addition the whole of the Algerine fleet was inside the harbour. The day was fine and clear and there was little wind, when soon after mid-day the rocket flats were hoisted out, their crews put into them and everything made ready for the coming fight.

At 2.30 p.m. the flagship anchored about 120 yards off the end of the mole and the other ships took up their positions as shown on the attached plan, when the Algerines who had watched this imposing display opened fire and the action became general. The gun and mortar boats took up their positions in the interval between the ships, but all the rocket boats moved up as quickly as they could to the vicinity of the flagship to engage the enemy's fleet inside the harbour.

This they did with such success that very soon not only was every ship in the harbour burning fiercely, but the harbour works and part of the town were also in flames. One enemy frigate alone defied their efforts when: "About 5 p.m. Major Gossett, R.E., volunteered to set fire to the Algerine frigate which was moored across the entrance to the harbour at the Mole head. Gosset, accompanied by the first lieutenant of the *Queen Charlotte* and an officer of the Marine Artillery, went in the barge of that ship under a heavy fire of musketry from the Mole and the batteries and boarded the frigate (which was not manned but they encountered some difficulty as the ports were all closed) and placing carcasses and combustible materials in coils of rope set her on fire in many different places." [1]

"A gallant young midshipman in Rocket Boat No. 8, although forbidden, was led by his ardent spirit to follow in support of the barge in which attempt he was desperately wounded, his brother officer killed and nine of his crew."[2]

[1] Extract from the account of the Expedition to Algiers by Maj.-Genl. F. C. Whinyates, in the "R.E. Journal," February 1st 1881. 3 R.E. officers and 39 sappers accompanied the flat. It was intended to land them on the Mole with a party of marines; but this was never carried out.

[2] Lord Exmouth's despatch.

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The bombardment continued till after 10 p.m. when the ships slipped their cables and stood out to sea, leaving the enemy's forts in ruins with only an occasional gun firing.

The fleet again stood in towards the mole on the next day. But the Dey had had enough and accepted all the terms, which included—abolition of Christian slavery, immediate delivery of all foreigners then slaves in the country, reparation to the British Consul for all the indignities that he had suffered, and a public apology by the Dey himself in terms dictated to him by the Admiral.

During this engagement the Rocket Troop lost Sgt. Thompson killed and four men wounded, and their good service was fully appreciated by Lord Exmouth who stated in his despatch:— "The flotilla of Mortar boats, gun and Rocket boats (under the command of Captain Michell) under the direction of their respective Artillery officers shared to the full extent of their powers in the honours of the day and performed good service. It was by their fire that all the ships in the port with the exception of the outer frigate were in flames, which extended rapidly over the whole arsenal, storehouses and gun boats, exhibiting a spectacle of awful grandeur and interest no pen can describe."

The main body of the fleet left Algiers on September 3rd, arriving back in Gibraltar on the 11th. All the men of the Rocket Troop were transferred to H.M.S. *Glasgow* on the 12th and sailed for Portsmouth on that day, arriving there on the 26th and disembarking at the gun wharf at 2 p.m. on the 28th.

THE SWEDISH DECORATIONS AWARDED TO THE OFFICERS AND MEN OF THE ROCKET BRIGADE FOR THEIR SERVICES AT THE BATTLE OF LEIPZIG.

In the year 1813, though the British Army had been fighting for many years, there was no official decoration or medal by which any specific act of gallantry could be rewarded. This, however, was not so in other continental armies of the period, and in the Swedish Army there was the decoration "För Tapperhet i Falt" (for brave conduct in the field)—a description of which has already

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appeared in this Journal (Vol. XL, No. 7). This decoration, instituted in 1788, has always been awarded for conspicuous gallantry in war and issued to officers in gold and other ranks in silver. It is always struck and never cast or engraved, and is still available for issue now-a-days should Sweden go to war.

A similar medal is issued to the Navy but the inscription on the reverse reads "För Tapperhet till Sjöss" (for brave conduct on the seas).[1] The ribbon for both medals is light blue and yellow. Recent research very kindly carried out by Captain N. G. Belfrage of the Generalstaben-Krigshistoriska Avdelning, Stockholm, at the request of Lt.-Col. Allan Uggla, has now thrown much new light on the award of these Swedish decorations to the officers and men of the Rocket Brigade for the Campaign of 1813 which may be of interest to officers of the Regiment. It is regretted that in an article of this size it will be impossible to publish all the transcripts of the letters so kindly forwarded to and now in the possession of "O" Battery, R.H.A. The introduction of one, however, is essential. It would appear that Lieut. Amherst Wright, who succeeded to the command of the Rocket Brigade when Bogue was killed, was asked to submit a list of the N.C.O's and men who distinguished themselves at Leipzig, for the award of the decoration referred to above.

This list, printed below, was prepared by him and forwarded through the usual channels until it is embodied in a letter in French to "Son Altesse Royale Monseigneur le Prince Royale" from Le Baron de Tawast, sous chef de l'état Major-General, on December 8th 1813.

The original is signed in the top left hand corner "Approuvé Charles Jean."

And the eight medals which had not been presented were delivered to the men who had been awarded them by Col. Bjornstierna on about the 12th January 1814.

[1] See page 464 "War Medals and Decorations"; by Irwin. The medal is wrongly described.

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A LIST OF NON-COMMISSIONED OFFICERS AND PRIVATES OF THE ROYAL ENGLISH ROCKET BATTERY WHO DISTINGUISHED THEMSELVES AT THE BATTLE OF LEIPZIG ON THE 18TH OCTOBER 1813.

	Lieut.	Strangways[1]	Fätt (i.e. Received)
	Serjeant-Major	James Wright	Fätt (,, ,,)
d. 25 nov.	Serjeant	Daniel Dunnet.	
anmälte	Bombardier	Thos Lloyd.	
genom und	Gunner	John Thimmonds.	
Memorial.	,,	John Eaves.	
	,,	George Munro.	
	Driver	George Fox.	
	,,	John Paltculls.	
	,,	John Bates.	

signed AMHERST WRIGHT,
Lt. Commanding
Royal English Rocket
Battery.

Col. Björnstierna.
S.L.
Chef d'Etat Major.

Note. It would appear from this that both Lt. Strangways and Sgt.-Major James Wright received their decorations on the battlefield, or very soon after it.

If this were the end of the story it would be simple, but another "Tableau de la distribution des Medailles en argent pour la bravoure" shows that eleven silver medals were awarded to and received by the men of the Rocket Brigade at this time, and Captain Belfrage has been unable to find out the names of the two other men that received them. There is, however, evidence enough to assume that one of these medals was awarded to Gnr. Thomas Wadkis[2] but the other cannot be traced. In addition to the above another issue of these decorations was made to the men

[1] Name written in pencil on the original.

[2] The group of two medals (i.e., Waterloo, and one of those struck Swedish decorations), awarded to this man has recently been purchased by the officers of "O" Battery, R.H.A. This group has been well-known to collectors for a great number of years, and in Colonel Palmer's private catalogue it is stated "I have a note that this pair was purchased from a relation of Thomas Wadkis; see catalogue, February 20th, 1905. —Glendinings."

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of the Rocket Brigade in 1820 (c p. Col. Leslie's article) when the following received them at Woolwich in August of that year.[1]

Sergeant	Michael Taylor.
,,	Robert Chalkley.
Corporal	Edward Marks.
,,	William Wareham.
Bombardier	John Guy.

It was unfortunate that Wright, when he sent in the list of names in 1813, merely sent in the names of the seniors of each rank and the oldest soldiers. The decoration must have thus lost all interest as such to the men and been merely looked upon by them as a medal commemorating the campaign of which insufficient were issued. Thus we find those that could afford it having either cast or engraved[2] copies made and wearing them. Hence the large numbers of spurious copies of the medal which exist.

With regard to the second list of medals awarded in 1820, these men were the next senior in rank to those that had already received it in 1813. It is probable that, knowing how the first recipients had been selected, the same system was continued for the second award, and indeed it is difficult to see what other system could have been followed in this case as all the officers who were present with the Brigade at Leipzig had left it.

Decorations, etc., awarded to the Officers.

Here the story is quite straightforward and is best shown as follows:—

Captain Richard Bogue was posthumously appointed a "Knight of the Swedish Military Order of the Sword" and the insignia of the order was sent to his widow on January 6th 1814.[3]

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[1] I cannot help thinking that this second award of these decorations was to commemorate either the fifth anniversary of the battle or the coronation of Bernadotte as king of Sweden. But this is only a surmise and I am unable to explain it in any other way.

[2] One such engraved medal is in Lord Cheylesmore's collection in the R.U.S.I. The Group awarded to Corpl. Marks, now the property of the R.A. Institution, includes one of these cast medals in addition to the struck medal that he was awarded.

[3] See Lt.-Col. J. H. Leslie's article in this Journal, Vol. XL, No.7.

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Lieutenant Amherst Wright was awarded :—[1]

(1) The medal in gold for "Brave conduct in the field" on the 17th January 1814.
(2) The rank of Captain in the Swedish Army on January 6th 1814.
(3) The Swedish Military Order of the Sword, 4th Class, on June 23rd 1820.

Lieutenant T. Fox-Strangways was awarded :—

(1) The medal in gold "For brave conduct in the Field" on the battlefield or very soon after it, as we have already seen.
(2) The rank of Captain in the Swedish Army on January 6th 1814.[1]
(3) The Swedish Military Order of the Sword, 4th Class, in June 1820.
(4) The Russian Order of St. Anne, presented to him by the Tsar on the battlefield.[2]

Note. Through the kindness of Lady Ilchester, I have been allowed to see the medals awarded to Brigadier Fox-Strangways. Nos. 1 and 4 referred to above are missing, though the miniature of No. 4 has been preserved. He had in addition the Waterloo medal and the Crimea war medal with three clasps, Alma, Inkerman and Sebastopol. The Turkish Crimea war medal if it was ever sent to his next of kin, is also missing.

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[1] P.R.O. Nos. W.O. 55/1164, page 315, and W.O. 55/1110, pages 165, 166, 326 and 328.

[2] "History of the Royal Artillery"; by Major Duncan. Vol. II, page 390.

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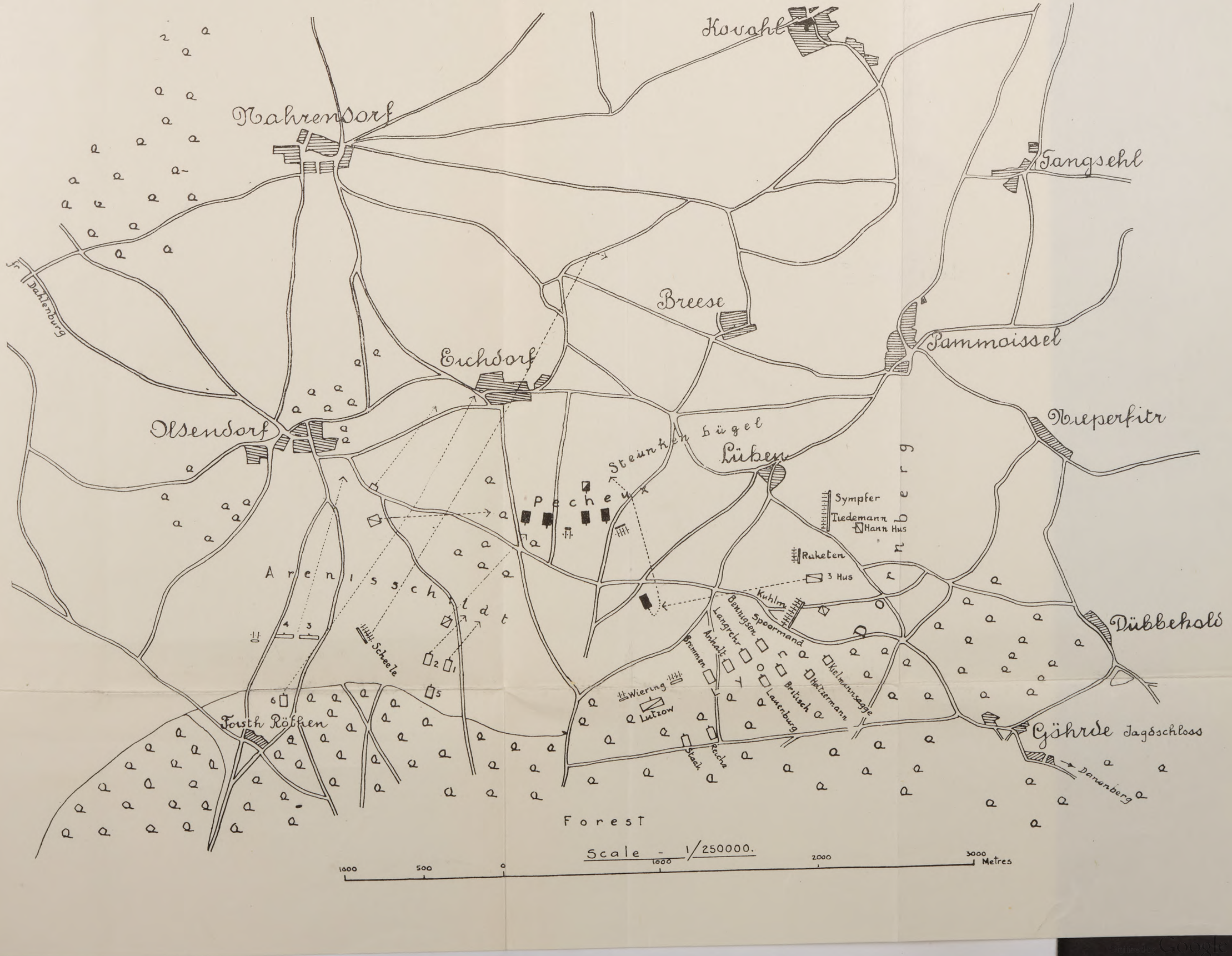
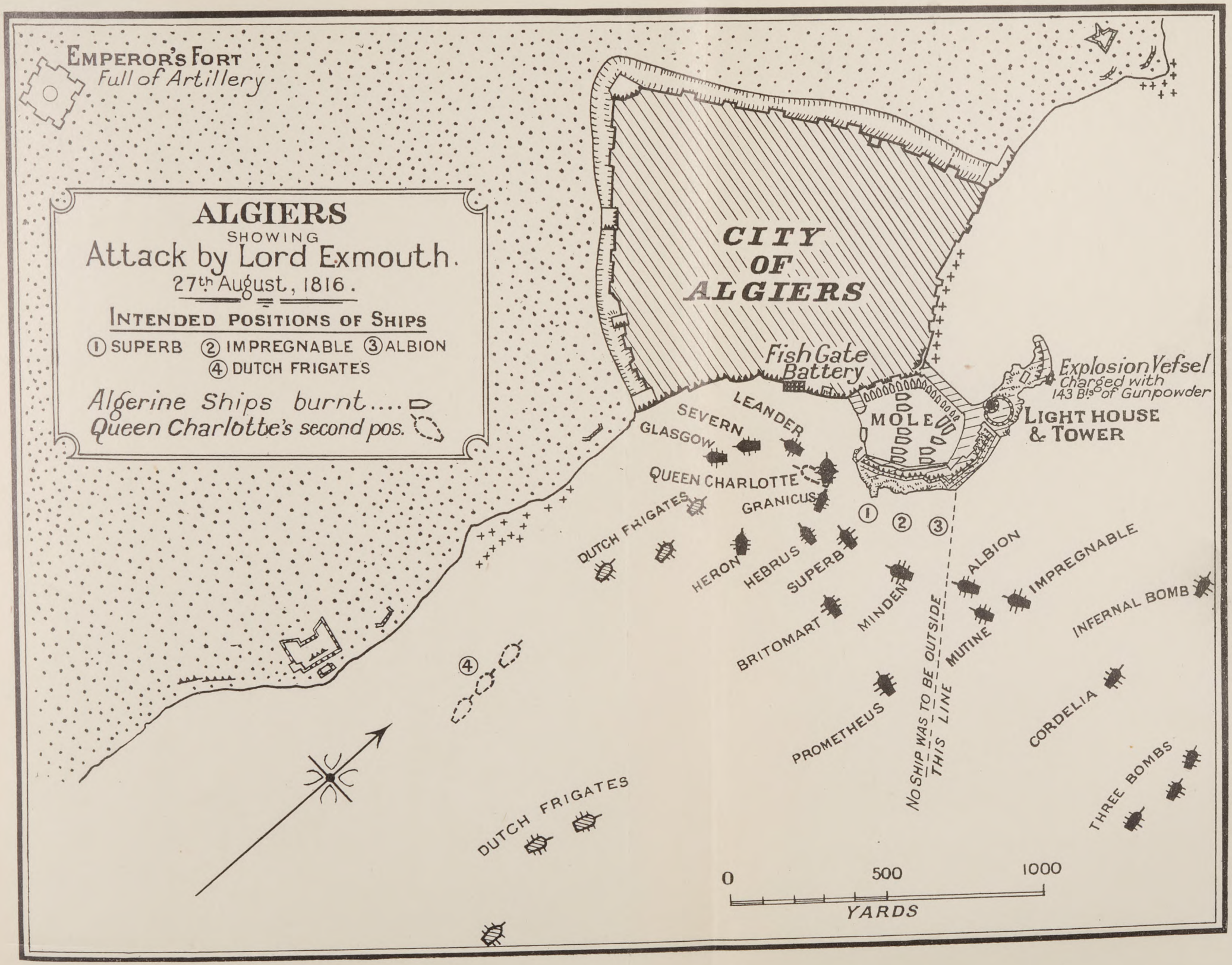
Göhrde 16. September 1813.



TOULOUSE
April 10, 1814

English Miles
1/4 1/2 3/4 1

To Mdi.
Bridge of Croix Daurade.
Croix Daurade
4th Div.
6th Div.
R. Hers
F R E I R E
Mamelon de la Pujade
SOMERSET
BERESFORD
A T E N
Les Minimes
Pont des Minimes
Languedoc Canal
Pont de Matabiau
PICTON
Petit Gragnague
Ponts Jumeaux
GREAT REDOUBT
FINAL POSITION
BOULOGNE
Calvinet
Mas des Augustins
V. GRUBEN
Pont de Baima
River Garonne
Suburb of St. Cyprien
Suburb of St. Etienne
REDOUBT
SYRIETX
Caraman
Y. GRUBEN
R. HERS
Suburb of St. Michel.
Pont des Demoiselles
River Garonne
To Carcassonne.
Languedoc Canal
GRUBEN
To Revel



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THE MASTER-GUNNER OF ST. JAMES'S PARK.[1]

By Major T. J. Edwards, F.R.Hist.S.

WAR is as old as mankind and as the principles have not altered to a great extent with the march of time, it is possible to trace the origin of almost every military appointment back to the dawn of history. The progress of the science of war and the invention of new weapons would necessitate the creation of specialists to deal with new complications, and herein we see the germ and growth of new appointments whose tenure depended upon the employment or supersession of the weapons concerned. Even in the Middle Ages we had our Scoutmasters, Trenchmasters, Waggonmasters, Mustermasters and a number of other "masters", each in charge of a distinct part of the army or performing distinct duties; but with the increasing employment of gunpowder, the introduction of the musket and bayonet and the abolition of the proprietary system, all these officials disappeared. In spite of all this change, the rise and fall of this military office and that, the Master-Gunner has stood firm and to-day it is possible to trace back to A.D. 1263 and place our finger upon the ancestor of the Master-Gunner of St. James's Park, the Premier Master-Gunner of England. Few, if any, military appointments can trace an unbroken lineage to such antiquity. From the available records it would appear that all the early Master-Gunners, with a few exceptions, were of Flemish origin, the last of this line being Anthony Fenrutter who was appointed in 1570. "The bookes that the Gunners have amongst them were, in the beginning, in the time of Henry VIII, made by Flemings; for in the war of those daies the King went over into Flanders, and those partes thereabouts, to have Gunners to serve him in the warres; and the Gunners have no other bookes but such as were written by them." (Bourne's "Art of Shooting", printed in 1587.)

The distinction of being the first Master-Gunner of England falls to Roger de Leyburn whose appointment dates from 1263. As Constable of Rochester Castle he was deputed to inspect several

[1] Based upon the works of Major R. H. Murdoch, Major F. Duncan, Lieut.-Colonel J. H. Leslie, and P.R.O. documents.

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forts, ballistrae, catapultae, etc., at Windsor, Rochester, Newhaven, Sandwich, etc. He was succeeded by Johannis le Flemyng as *Magister* Ballist, in which capacity he acted through the wars of Edward I. It was at the battle of Crecy in 1346 that gunpowder was first used in the field, and Edward III's Master-Gunner of England, John Parry, struck terror into the enemy with "five or six pieces of cannon, it being the first time they had seen such thundering machines." Referring to the siege of Calais (1367) Murdoch[1] gives a statement of the Staff of the Master-Gunner of England, together with their daily rate of pay (i.e. sixpence) but, unfortunately he does not mention the pay of the Master-Gunner. With regard to the battle of Flodden (10th September, 1513) it is recorded that—"The Master-Gunner of the English part opened his fire, slew the Master-Gunner of Scotland and beat all his men from their ordnance", which indicates that a similar appointment existed in Scotland at that period.

From 1537 to 1534 Sir Christopher Morrice was Master of the Ordnance" as well as "Master-Gunner of England"; after that date he became "Lieutenant of the Ordnance" concurrently with his Master-Gunnership. It was in 1537 that Henry VIII granted a charter to the Artillery Company, now the Honourable Artillery Company, and Sir Christopher Morrice was appointed one of the overseers of the Company.[2] He was wounded at the siege of Boulogne and died shortly afterwards. Christopher Cowld is mentioned in a Royal Warrant of Queen Elizabeth as being appointed in 1547 and wherein his rate of pay is described as 2s. per diem, a rate enjoyed by Members of Parliament at that time. This rate was repeated in a few subsequent Warrants. The Master-Gunner, however, had certain additional allowances referred to as "all and every other fees, perquisites, profits, allowances, commodities, advantages, rights, jurisdictions, privileges, precedence, and emoluments, in the aforesaid office in large and ample measure,", which amounted to about £190 annually.

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[1] "Succession List of the Master-Gunner of England". By Major R. H. Murdoch, R.A.

[2] The Ancient and Honourable Artillery Company of Boston, Massachusetts, the oldest military body in America, is an offshoot of the English Honourable Artillery Company.

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During the reign of Edward VI (1547-1553) the gunners of England appear to have been a very "scratch" crew. They were, as recruits, anything from sixty-four to ninety-two years of age. Their pay was 4d. to 1s. a day, the master-gunner 1s a day, and the Master-Gunner of England 2s. a day. The qualifications for appointment of the latter class appear to have been their skill in "making of pleasant and warlike fireworks."

A Royal Warrant of 1602 by Queen Elizabeth authorized the daily rate of pay for the Master-Gunner of England to be two shillings. The following excerpt from the Warrant indicates the method of payment:—

> "To have, enjoy, receive and draw, by the year, the same wage and fee to the aforesaid Anthony Fenrutter and his assigns, from the feast of Passover last past, *during his natural life*, of Our Treasurer and Secretary, of Us, Our Heirs and Successors, by the Hand of Our Treasurer and Chamberlain at the time being, on both parts to the feast of St. John the Baptist, St. Michael the Archangel, Day of Nativity and Annunciation of the Blessed Virgin Mary, in equal portions of silver at one payment, with all and every other fees, perquisites, profits, allowances, commodities, advantages, rights, jurisdictions, privileges, precedence, and emoluments, in the aforesaid office in as large and ample measure as the said Christopher Cowld or Richard Webb, now defunct, or either of them or any of their predecessors in the aforesaid office had or have had or received, or of right ought to have or receive or to have had, etc., in and for the same as by letters patent to them may have been maintained."

William Hammond was appointed in 1611 and when he accompanied the army on service in 1621 he was granted special field pay at six shillings a day.

After the Restoration Master-Gunners of England were selected from persons of a higher social grade than formerly. The first Master-Gunner after the Restoration was, however, Colonel James Weymes who had previously held the appointment under Charles I and who was taken prisoner by the Parliamentarians at the battle of Cropredy Bridge. It was for services to his father that Charles II re-appointed Weymes in 1660. Weymes was succeeded in 1666 by Captain Valentine Pyne, a mural tablet to whom is in

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the Church in the Tower of London, the only one erected to a Master-Gunner of England.

In 1682 a residence for the Master-Gunner was provided at Woolwich and in 1683 a Royal Warrant was issued setting forth his duties, excerpts from which are as follows:—"To profess and teach his Art to Our Under-Gunners in the exercise of shooting of Great Ordnance; Morter Peeces etc. in such Publique Place or Places as by the Master of Our Ordnance shall be allotted and appointed for y^{r} Purpose and therein to Exercise them once a Moneth in Winter and twice ev'ry Moneth in Sommer" . . . . "To Certify to Our Master of Our Ordnance, or Our Principall Officers the Ability of any Gunner or Scholler" . . . . "To keep a Register of all Gunners that receive any Fees from Us" . . . . "To keep Likewise an Exact List of all Our Great Guns as well Brass as Iron belonging to any of Our Ships, Forts, Castles, Blockhouses or Garrisons". The warrant also authorizes his rate of pay to be £190 per annum.

Writing in 1758, Bolton in his (Medieval) State of Great Britain, says—"The Master-Gunner of England is an Officer to teach all such as learn the art of gunnery and to certify the Master-General the ability of any person recommended to be one of the King's Gunners. To every school he administers an oath not to serve without leave, any other Prince or State, or to teach anyone the Art of Gunnery but such as have taken the oath, and these artificers were not to quit the country without the King's leave". According to the Artillery Records, James I, Charles I and II added further to the duties that of superintending the firing of salutes and of fireworks in London in honour of Royal birthdays, and other celebrations in commemoration of national victories, etc. At this period the Master-Gunner of England was Captain Richard Leake, Master-Gunner of H.M.S. *Speedwell* and later of *Princess*, who was appointed on the strength of his "good service during the warr with the French, Deane, and Dutch by sea and land". The Master-General of the Ordnance was Lord Dartmouth (who raised the Royal Fusiliers [City of London Regiment] in 1685) who, in conjunction with Leake brought all the Master-Gunners in Great Britain under the Master-General of Ordnance (instead of the Master-Gunner of England), a course which was maintained

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until the Board of Ordnance was abolished in 1855. The last occasion when the Premier Master-Gunner took the field on active service was when Leake served against William of Orange in 1688. He retained his office, however, until his death in 1696.

The Master-Gunnership of England now enters upon a new phase in that instead of being open to selection from all sources it is confined to distinguished artillery officers and carries a substantial increase in emoluments. There has only been one exception to this procedure, Captain Thomas Silver. The first appointment under the new system was conferred upon Lieut.-Colonel George Browne in 1696, on the recommendation of Marlborough whom he had served with great distinction on the Continent. Browne was followed by Silver in 1702. He too had served under Marlborough but in the capacity of Deputy or "mate" to the Master-Gunner of England. Silver was succeeded by Colonel James Pendlebury in 1710. Pendlebury was the last "Master-Gunner of England" for during his term of office the Board of Ordnance gave birth to the Royal Artillery (1716) upon which the title of the office was altered to "Master-Gunner of Whitehall and St. James's Park" with an official residence in St. James's Park and reduced allowances at three shillings a day. He died in 1758. Before 1716 the Master-Gunner's official residence was at the Tower of London where his duties principally lay, supervising the fee'd gunners.

In 1716 there was a definite attempt by the Board of Ordnance to abolish the office of Master-Gunner. On 10th January, 1716,[1] they sent a letter to the Duke of Marlborough, then Master-General of the Ordnance, suggesting various economies. One of the posts "Proposed as they become vacant not to be filled again" was the "Master-Gunner of Great Britain[2] at £190 per annum". However, the post was saved with the altered title just mentioned.

Pendlebury's successor was a remarkable man with a romantic career—Captain Joseph Brome, who at this period, 1759, was A.D.C. to the famous Marquis of Granby. Brome's mother was Mary Hicks, daughter of the lord of the manor of Charfield, Gloucester-

[1] P.R.O./W.O./54/199.

[2] This is the only instance in which the office has been described as Master-Gunner of *Great Britain*, as far as I have discovered.—(*T.J.E.*).

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shire; his father was Joseph Walton of Southwark. Their son, Joseph, was born in 1711 or 1712, and when his father died his mother married Corporal Charles Brome of the Artillery at Minorca. Corporal Brome was later commissioned and rendered distinguished services. At the age of eight years young Joseph at Minorca enlisted as a drummer in the Company of which his step-father was Corporal. He too received a Commission, rose through all the ranks to Lieut.-General and at his death in 1796 at the age of eighty-four was Colonel Commandant of the R.A., Commandant of the Woolwich Garrison, Master-Gunner of St. James's Park, and lord of the manor of Charfield. Some of his children took the name of Walton and others that of Brome. He is buried at St. Nicholas Church, Plumstead. Brome never forgot how to beat a drum. When Commandant of Woolwich he was entering the garrison one day when the drummer on duty with the Guard did not beat the salute to Brome's liking. He promptly snatched the drum from the drummer, and passing the sling over his shoulder, beat the salute in expert style to the amazement of his staff. On handing back the drum Brome remarked—"There, young fellow, that's how I beat the salute when I was a drummer." Brome was succeeded by his son, Major-General Walton, in 1796, with the altered title of "Master-Gunner of St. James's Park", which it has remained to the present day.

With Walton's appointment the office entered upon a new phase in that the holder has been ever since a general officer of the Royal Artillery. In 1910 it was decided that the pay of the "Master-Gunner of St. James's Park", which at that time was 4/6 a day, should lapse on the death of Field-Marshal Lord Roberts and that in future it should be an honorary post comparable to that of the Colonel of a Regiment. On 16th May, 1904, His Majesty King Edward VII commanded that at the first levee of the season in each year, a copy of the General State of the R.A. should be presented to him by the senior officer, immediately previous to the commencement of the ceremony.

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SUCCESSION LIST OF MASTER-GUNNERS OF ENGLAND.

Reign	Rank, name, etc.	Period From	To
Henry III. 1216—1272.	Roger de Leyburn	1263	
Edward I. 1272—1307.	Johannis le Flemyng	Untraced.	
Edward II. 1307—1327.	Untraced. John Crab, a Fleming, was at this period Master-Gunner in Scotland.		
Edward III. 1337—1377.	John Pary, or Parry	Untraced.	
Richard II. 1377—1399.	Untraced.		
Henry IV. 1399—1413.	Untraced.		
Henry V. 1413—1422.	Nichol Merburg (or de Merburg)	1414	
Henry VI. 1422—1461. Edward IV. 1461—1483.	As Merburg's appointment was for life, he may have covered a portion of this period.		
Richard III. 1483—1485.	Patrick de le Meyte	1483	
Henry VII. 1485—1509.	Richard Fawconer	1485	
Henry VIII. 1509—1547.	do.	1509	1511
	Thomas Harte, or Hart	1511	1513
	William Blackenall, or Blackenal	1513	1523
	Christopher Morris	1523	1546
	Christopher Cowld	1546	1547
Edward VI. 1547—1553.	Christopher Cowld	1546	1553
Queen Mary 1553—1558.	Richard Webb	1553	
Queen Elizabeth 1558—1603.	Richard Webb		1570
	Anthony Fenrutter	1570	1578
	Stephen Bull	1578	1589
	Stephen Bull (Junior)	1589	
James I. 1603—1625.	Stephen Bull (Junior)		1611
	William Hammond	1611	1623
	John Reynolds (Reynold or Reignolds)	1623	
Charles I. 1625—1649.	John Reynolds		1638
	James Weymes ... ... (Royalist).	1638	1645
Commonwealth 1645—1660.	*Francis Furvin	1645	1649
	*Richard Wollaston ... ... (*Both parliamentarians).	1649	1660
Charles II. 1660—1685.	Colonel James Weymes ... ... (Re-appointed).	1660	1666
	Captain Valentine Pyne	1666	1677

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Reign	Rank, name, etc.	Period. From	To
William and Mary. 1689—1702.	Captain Richard Leake, R.N. ...	1677	
	do. do.		1696
	Lieut.-Colonel George Browne	1696	1702
Anne 1702—1714.	Captain Thomas Silver	1702	1710
	Colonel James Pendlebury, R.A.	1710	1758
George I. 1714—1727.	do. do.		

Title changed in 1716 to

MASTER-GUNNER OF WHITEHALL & ST. JAMES'S PARK.

George I. 1714—1727.	Colonel James Pendlebury, R.A.	1710	
George II. 1727—1760.	do. do.		1758
	Captain Joseph Brome, R.A. ...	1759	
George III. 1760—1820.	do. do.		1796

Title changed in 1796 to

MASTER-GUNNER OF ST. JAMES'S PARK.

George III. 1760—1820.	Major-General Joseph Walton, R.A.	1796	1808
	Lieut.-General Sir John Macleod, G.C.H.	1808	
George IV. 1820—1830.	do.		
William IV. 1830—1837.	do.		27 Jan. 1833
	Major-General Sir Alex. Dickson, G.C.B., K.C.H.	28 Jan. 1833	
Queen Victoria. 1837—1901.	do.	—	22 Apr. 1840
	General Sir Robert Gardiner, G.C.B., K.C.H.	1 May 1840	26 June 1864
	Field-Marshal Sir Hew Dalrymple Ross, G.C.B.	1 July 1864	10 Dec. 1868
	General William Wylde, C.B. ...	11 Dec. 1868	14 Apr. 1877
	General Sir John Bloomfield, G.C.B.	15 Apr. 1877	1 Aug. 1880
	General Poole Valencey England	2 Aug. 1880	6 Nov. 1884
	General Sir John St. George, G.C.B.	7 Nov. 1884	17 Mar. 1891
Edward VII. 1901—1910.	General Sir Collingwood Dickson, V.C., G.C.B.	18 Mar. 1891	20 Nov. 1904
	Field-Marshal Rt. Hon. F. S. Earl Roberts, V.C. K.G., K.P., G.C.B., etc.	29 Nov. 1904	14 Nov. 1914

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Reign	Rank, name, etc.	Period From	Period To
George V. 1910—	General Sir Robert Biddulph, G.C.B., G.C.M.G., Colonel Commandant, R.A.	15 Nov. 1914	18 Nov. 1918
	Major-General Sir Francis Wm. Ward, C.B., Colonel Commandant, R.A.	19 Nov. 1918	27 Mar. 1919
	General Sir Edward Francis Chapman, K.C.B., Colonel Commandant, R.A.	28 Mar. 1919	12 May 1926
	General The Lord Horne, G.C.B., K.C.M.G., D.C.L., LL.D., Col. Commandant, R.H.A. ...	13 May 1926	14 Aug. 1929
	Field-Marshal Sir George F. Milne, G.C.B., G.C.M.G., D.S.O., D.C.L., LL.D., Colonel Commandant, R.A.	15 Aug. 1929	

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THE DESIGN OF A MORTAR FOR CLOSE SUPPORT.

By Major James Price, R.A.

THE mortar appears to flourish only in time of war. In peace new weapons and new methods are produced but the mortar soon comes to be looked upon as an archaic device until finally it disappears, only to be resuscitated in the next war of any magnitude. The effect of this is unfortunate in that each design has been a new and hasty improvisation for a special purpose and not the result of continuous development as in the case of other weapons. However, there has recently been a departure from this policy and mortars are being reintroduced in peace time for close support. One may therefore hope that they will now enjoy the advantages of starting with a thoroughly considered design and of progressive improvement as time goes on. It is proposed here to examine from the user's point of view the factors which may affect this design and to try to arrive at a general specification of the weapon required.

General Suitability.

The advantages of a mortar as a close support weapon are as follows:—

(a) The equipment is light in relation to its range and shell power.

When a gun is fired at low elevation the recoil tends to drag the mounting backwards and, the horizontal strain which can be put on the surface of the ground being limited, it becomes necessary to interpose a recuperator system to reduce the violence of the recoil. At the same time to counteract the tendency to lift in front a mounting of considerable length is required. With the mortar, however, since fire at low elevations is eliminated and the recoil acts downwards, provided there is distribution over a reasonable surface and the material is strong enough, there is no need of a recuperator nor of any special lengthening of the mounting. With the 3·7″ howitzer, for instance, it will be seen that most of

(1 The word mortar is taken to mean any low velocity piece capable of using elevations above 45 degrees).

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the weight of the mounting is caused solely by the need of checking recoil and giving steadiness at low elevations.

(b) Crest clearance difficulties are eliminated and a mortar can make use of any cover available no matter how short the range.

(c) Owing largely to the low velocities employed a considerable degree of simplicity is possible.

(d) Its steep angle of descent gives it great power of attacking an enemy behind cover.

The disadvantages are :—

(a) Its fire is naturally less accurate than that of a similar gun firing below 45 degrees.

(b) It is difficult to keep the shell steady in flight. With the low pressures employed, the ordinary system of centring and obturation by a driving band cannot be used, though it is conceivable that a special type of driving band could be produced for the purpose. The present normal system of wings gives, however, fairly satisfactory results.

(c) Although it is easy to conceal, once a mortar has opened fire it is very liable to draw fire in reply. By following the flight of the bomb as it rises above the cover which conceals the mortar the enemy can readily deduce its approximate position.

(d) In defence the usefulness of the mortar is limited by its comparatively short range and by its inability to deal with tanks effectively. The latter disadvantage is not of very great importance.

Apart from the great technical difficulty of designing a "dual purpose" weapon, the expediency is now recognised of divorcing anti-tank defence from close support owing to the incompatibility of their tactical dispositions—a gun suitably placed for close support will be tucked away out of reach of small arm fire while an anti-tank gun must have a clear field of fire and can at best be in a semi-covered position. It is probable, moreover, that the combined personnel and transport of one close support mortar and one pure anti-tank gun will not be much greater than that of one "dual purpose" weapon of the type of the 3·7″ howitzer.

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Design.

The following points must be considered in the design of a close support mortar.

(a) *Portability.* To fulfil their tasks mortars must be highly mobile and capable of getting anywhere. Constant movement also is the only way to counteract their fatal attraction for hostile shell. At the present time use with mechanized transport is being primarily considered, but as far as possible the weapon should be made suitable for employment with several forms of transport so as to avoid multiplicity of equipments. These forms of transport include man carriage, pack and unmechanized draught.

In man carriage the ideal is that each load should weigh between 50 and 60 lbs. This is the most economical unit of weight when man carriage is the sole means of transport—as it is in bush warfare, in which a mortar can be a most effective weapon. Heavier loads can be carried but they necessitate more than one man to a load which is a disadvantage. The method by which the man carries his load should be considered, and this varies with the country; the head, the shoulder and the back being used. For Europeans the back is probably the best when a pack of the Yukon type is provided. Such packs were issued in the Great War, but were not generally liked. Where, however, the men had been shown how to make use of them they proved most efficient and became quite popular.

For pack transport with mules two side loads of 90 lbs. each or one top load of 180 lbs. should be the limit of weight. The shape of the load and the position of its centre of gravity must also be considered—no side load as carried should project more than 30 inches in front of its centre of gravity, with a top load the limit is 20 inches. In practice, however, it is probable that any equipment designed for man carriage can be easily adapted to pack.

The whole equipment should be capable of being drawn by a single animal along narrow winding tracks.

Maximum weight	600 to 700 lbs.
Maximum wheel track	3′ 6″ to 4′.
Minimum clearance from ground	1′ to 1′ 6″.

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If transport is mechanized no difficulty is likely to present itself with any equipment coming within the above limits.

The more enclosed the country the greater will be the need for close support and mortars must therefore be ready to occupy positions difficult of access. It follows that with all forms of transport the equipment will sometimes have to be carried short distances by man power. In no case, therefore, should a load weigh more than 180 lbs. which is the limit of weight which can be carried for short distances by two men. If more than two men are needed to move the load very great difficulties arise when the ground is broken or obstructed (e.g. over ditches, in woods, etc.). When used either with draught or mechanized transport the mortar should move complete and ready to open fire quickly.

(b) *Simplicity*. Owing to the nature of the work simplicity of design is essential and demands that the equipment should not consist of a number of small detached parts which are liable to get lost or which must be fitted together on coming into action. It must, however, be subordinated to safety and accuracy. During the Great War rough systems were adopted in which the safety of the detachment depended on the correct carrying out in the field of numerous skilled operations, and not unnaturally errors and omissions occurred with unfortunate results. The weapon must be safe to handle.

(c) *Accuracy* is all important so that time and ammunition can be economised. The weapon must be suitably equipped and accurate enough to find and destroy its target with the least ammunition in the least time. Neither great speed nor great accuracy alone is sufficient, the one will waste ammunition which has been carried forward probably under fire while the other may only produce its effect too late.

If it is to find its target economically and rapidly an efficient means of correcting line and elevation must be provided, and in this, laying for line presents the greatest difficulty. It should be realized that the normal position for a mortar is in close cover, either in a hollow or amongst trees or houses where no aiming point is available so that a dial sight can seldom be used. The important point is to provide a means by which line corrections can be accurately applied. This principle was effectively carried out

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in the 6″ mortar. The laying for line was by means of an ingenious cross level arrangement near the muzzle, which had the added advantage of keeping the graduations out of the mud of trenches. The actual laying, however, required considerable knack and probably for moving warfare the best method is to arrange that line laying should be done by traversing and deflection arcs on the platform. In this system the accuracy of line depends on the platform remaining fixed in the same alignment during firing but this is not difficult to ensure as the bearing surface of the platform is large and the recoil tends to make it bite deeper into the ground. Both the dial sight and the director can be eliminated since the initial line can be given by compass with accuracy sufficient in view of the short ranges.

Accuracy of elevation is simply provided, but to ensure speed the clinometer should be fitted so that it remains in position constantly during firing. It is important that the opening elevation should be approximately correct. A range-finder should therefore be included in the equipment, but for measuring the angle of sight a pocket clinometer is all that is needed since errors have comparatively little effect on range.

To destroy the target without waste of time or ammunition a small zone is essential.

In comparing the length zone with the range, one must accept a lower standard than with ordinary guns. With the 18 pr. Q.F. the 50 per cent. length zone is roughly 1 per cent. of the range, with the 3·7″ about $1\frac{1}{2}$ per cent., and with the 3″ mortar about $2\frac{1}{2}$ per cent. Actually what matters is the size of the zone on the ground and (with a shell of not less than 20 lbs.) if this is not much more than 50 yards at extreme range, the accuracy is sufficient. It is therefore reasonable to ask for a length zone of not more than 2 per cent. of the range. To obtain the accuracy required a breech-loading system might have to be adopted but the loss in simplicity and rate of fire would be a serious drawback.

At extreme ranges with the low velocities employed accuracy falls off. It is, however, for consideration whether a combination of high and low angle fire may not meet the case. For long ranges a mortar might well use its lower trajectory (say 30 to 45 degrees) reserving its high angle fire for the shorter ranges when crest clearance difficulties arise.

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The range and shell power required are the factors which decide in the main the total weight of the equipment.

(d) *Range* is a much debated point. There is a tendency to ask for more and more range. It is told of a Regimental dinner in the early nineties that, after a succession of speeches unanimously approving of the greater range of the new field gun, one venerable officer rose to disagree. His final reason for dissent was concise and conclusive—"Damme, Gentlemen, you can't *see* more than 1000 yards." And one must admit that except in very open country he was not far wrong.

The whole point of the close support weapon is the elimination of long communications, and the limit of observation fixes the limit of useful range of the gun. Without, however, accepting the conservative figure quoted above there is another limit to its useful range. The close support weapon is for battalion close support and it is reasonable to suppose that it can be pushed up to within 1000 yards of the forward elements. It will be rare that the locality holding up our advance will be more than 2000 yards beyond and therefore a range of 3000 yards should be sufficient. If the locality is further back, it is a suitable target for other forms of artillery which will then be able to utilize cover in the forward area without being involved in crest clearance difficulties.

(e) *Shell power.* It is commonly supposed that a heavy shell makes ammunition supply difficult. This is a fallacy provided one shell is not more than a one-man load; in fact it is probably easier to get forward one 40 lb. shell than four 10 lb. shell. The heavier shell is richer in high explosive and is also more accurate. Furthermore its moral effect is greater out of all proportion to its greater weight and charge.

The rôle of the close support weapon is to engage small centres of resistance which have very probably already been subjected to the fire of other artillery. One must therefore expect to be dealing with determined men, and time will always be of vital importance. If such an enemy is to be induced to relinquish his position quickly it must be impressed on him that annihilation will be the certain consequence of further delay. This result will best be achieved by employing the more powerful shell and if this is done, besides a saving of time, an actual economy in weight of ammunition may be effected.

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The 6 inch mortar was not often used for close support in mobile operations owing to the fact that suitable transport for the piece and its ammunition was not provided. When, however, it did have its opportunity, it was observed that a very few rounds had instant and telling effect.

Although the 48 lb. bomb of the 6 inch mortar is most effective it cannot get sufficient range without having a very heavy equipment. The 9 lb. bomb of the 3″ Stokes is definitely too light. Probably the best weight to adopt is between 20 and 40 lbs., the practical limit being fixed by the maximum range required and the maximum weight of equipment admissible. The maximum rate of gun fire must also be considered. The 3″ Stokes with a rate of fire of 20 rounds will discharge 180 lbs. of shell a minute, whereas the 6 inch mortar with a rate of fire of 12 rounds can deliver the exceptional weight of 580 lbs. Allowing, however, for the conditions of ammunition supply in moving war a fire power of 300 lbs. a minute would be ample.

Communication.

Although the ideal for mortars is "voice control," occasions will frequently arise when a covered position cannot be found close enough to the O.P. to allow of its use. Visual signalling will rarely be feasible owing to the proximity of the enemy and therefore provision should be made for communication by telephone. About half a mile of cable should be ample for each section, touch with other units and between sections being maintained by lamp signalling or by orderly.

General conclusions as to design.

Maximum weight of equipment ...	700 lbs.
Maximum number of loads :—	
Man carriage	12.
Pack	4.
Ideal maximum weight of one load ...	60 lbs.
Absolute maximum weight of one load	180 lbs.
Limits of weight of shell	20 to 40 lbs.
Fire power about	300 lbs. a minute.
Extreme range	3000 yards.
Maximum 50% length zone	2% of range.

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Hitherto one of the reasons for having mortars has been economy, but in a close support weapon to be used in small numbers and scattered on important individual tasks, reliability and efficiency are the chief considerations. These will be obtained by the simplicity of design which in itself makes for cheapness. All design represents a compromise of ideals and one must naturally be prepared to accept modifications to produce a practical result. None of these, however, should include a tendency to lessen shell power. In close support the mortar is called upon to do the work of a field gun and unless it is given at least equal weight of shell, it will become an indifferent substitute to be used only in the last resort. It should, rather, be designed to take its proper place as a distinct weapon of formidable offensive power.

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"MULTIPLICATION IS VEXATION."

By Major (Bt. Lt.-Colonel) A. F. V. Jarrett, m.c., R.A.

"DIVISION is as bad; Rule of Three doth puzzle me and Fractions drive me mad." In this manner has the poet expressed the innermost feelings of the average man. Scientists have sought in various ways to make life easier for him, and it is unfortunate that the average artilleryman has always regarded the scientist's most successful remedy as something worse than the disease. Now, however, that the slide rule has received official recognition in Vol. II by way of some hopeful remarks in the body of the work and a highly compressed appendix, an attempt to explain its use in a more digestible form may possibly be of interest to some whose contempt for the instrument has not been bred by familiarity. These notes are not intended as an appeal to the battery commander to undertake the study of the slide rule in addition to his other duties; there is no doubt that whoever has to use the thing must keep himself, to a certain extent, in practice. There are, however, many simple mathematical problems to which a reasonably accurate answer is sometimes urgently required; and it is hoped to show herein that quick and accurate answers to such problems can be obtained without any but the mildest mathematics, at the very small cost of one more bulge in the B.C.A's haversack. There are some, otherwise worthy, persons in authority, who forbid the appearance in public of this maligned weapon; it is hoped that such may be persuaded to accept results without unnecessary enquiries into procedure.

As to the instrument itself; of the making of slide rules there is no end, and it is not possible to consider here every known variety; no one who has a preference for any particular kind will read as far as this, and we may, therefore, confine ourselves to the ordinary ten-inch article of commerce, which seems to satisfy most civilian requirements, is almost everywhere obtainable, and does all that the Gunner has need for. Every sum which that Gunner has to do in his haste may be put in the form of a fraction or

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fractions, such as: $\frac{8}{4}=\frac{\text{something}}{16}$ or $\frac{a}{b}=\frac{x}{c}$ where a, b and c are known, while x is not. When the figures involved are simple and a rough answer is good enough, mental arithmetic suffices; when, however, it is desired to take advantage, in great haste, of the full accuracy which the gun can give, the mental processes necessary for such arithmetic are apt to give way; the average mind becomes a blank, and the rough answer is, in desperation, relied on.

The log table will give accurate answers with adequate expenditure of time, but mistakes have been known to occur in the best of circles, and the time available is not always adequate. The Artillery board does a great deal but takes some time to prepare; it also can and sometimes does produce errors more gross than those it was designed to prevent. The slide rule cannot lie (comparatively speaking), and it is precisely this type of sum with which it can most adequately deal. Taking our fraction again, $\frac{a}{b}=\frac{x}{c}$; if we had but to draw a horizontal line, and write a, b and c in their appropriate places, and could then find that someone had written the answer where we have had to put "x", our troubles would be small; and this is, in effect, what does happen when we use the slide rule. This is all the mathematics that it is necessary to know; and if this idea of the slide rule is kept in mind there should be no difficulty in solving any problem which can be set out in this fractional form. There are not many problems to be considered.

The most usual type of sum to be dealt with is the old "Gunner's Rule" in one of its manifestations; for instance:—

Example 1. What does (?or do) 130 yards subtend at 4750. Vol. II gives the formula as $\frac{H}{R}=\frac{m}{3438}$, and this is on the whole the most convenient form of the Gunners Rule; the angle is in minutes and both the distances in the same unit. This sum becomes $\frac{130}{4750}=\frac{m}{3438}$. It is easiest at first to use the two top scales only (Vol. II calls them A and B); the B scale is manipulated until 475 (or as near this as can be conveniently read) is under 13 on the A scale. Looking on the B scale between 34 and 35, we read on the A scale above that point the figure 94. How do we

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know where to put the decimal point? There are various rules by which it can be mechanically found, but common sense is the best rule of all; looking at the sum in its fractional form it is clear that, since 3438 is much the same as 4750 (i.e. it is not 34·38 nor 34380) m must be much the same as 130 (i.e. neither 9·4 nor 940). It must therefore be 94, or 1° 34′. The "$\frac{6}{10}$ rule" makes quite a nasty sum of this if one tries to do it accurately in one's head.

This form of the gunners rule is useful in many ways, especially in alliance with the slide rule, and works equally well when upside down. We may, for example, want to know what 100 yards subtends at any range. We can write the formula thus:— $\frac{R}{100}=\frac{3438}{m}$ We have only to put 100 under the appropriate range; under 3438 we read the corresponding minutes. In an FG shoot this has an obvious application. Again we may, at any particular range, wish to know what angle is subtended by various distances. Here $\frac{m}{H}=\frac{3438}{R}$. Setting R under 3438 we read the appropriate minutes over the distance H. It should be noted that the A and B scales are double, every figure appearing twice; it is quite immaterial which figure is used.

A problem in multiplication can easily be turned into the form required. For instance:—

Example 2. $24\times735=x$. In other words $\frac{24}{1}=\frac{x}{735}$; or $\frac{735}{1}=\frac{x}{24}$. Using either form we find that x is 176; using common sense we see that x is about 20 times 700, roughly 14,000; x must therefore be 17600. The only difficulty here is to be certain of the meaning of 1; and 1 is any end of any scale. So if we find in such a sum that the answer is coming "off the map" we need only rewrite the sum as $\frac{x}{735}=\frac{24}{1}$ to get over this trouble.

Again "Division is as bad."

Example 3. $\frac{735}{24}=\frac{x}{1}$; and $x=30{\cdot}6$ (mentally $\frac{700}{20}=35$).

Occasionally we meet these two troubles in combination.

Example 4. $\frac{38}{85}\times\frac{43}{126}=x$. This is really two sums:— $\frac{38}{85}=\frac{y}{1}$; and $\frac{y}{126}=\frac{x}{43}$; y is easily found and marked by the cursor; and x is found as easily once y is known. Common sense again tells

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us that x (which appears to be 154) must be roughly $\frac{1}{2}\times\frac{1}{3}=\frac{1}{6}$. This is about ·2; so x must be ·154, and this is as nasty a sum as we are likely to have to deal with in a hurry.

Very frequently our sums are not in plain figures; the nature of these problems involves the use of sines and other angular functions; the slide rule will produce all of these although it only seems to deal with two, the sine (S scale) and tangent (T), and neither of these is given for the complete right angle, still less for the whole way round the clock. This last fact entails the use of θ, which should by this time have been Robbed of all its Terrors; there is no need to investigate θ in this place. A few examples will clear up the remaining difficulties; there are not many.

Example 5. Subtense measurements. The sub base is 26 metres, the subtense angle is 2° 14′. We can find the distance in two ways:—

(a) Using A and S scales; the ordinary formula may be written thus:—$\frac{\text{Subtense}}{\tan \text{S}}=\frac{\text{Distance}}{1}$. Since with small angles there is no difference between sine and tan, we put 2° 14′ on the S scale under 26 on A; over 1 we read 670. To get the decimal point we want to know roughly the value of sine S. Closing the slide and rule we see that 90 is 1; sine 6° about ·1; sine 2° 14′ is therefore about ·04; hence distance is about $\frac{2600}{4}=600$. We know this already, of course, since the sub base to be put out should be about $\frac{1}{20}$ of the estimated range. This brings us to a most useful check which should be applied to all these survey problems which have to be done in the field, however learned the solution employed. Estimate what the answer should be; if the result differs violently from the estimate it is probable that the result is wrong. This will seldom let us down as regards the decimal point, unless the figure is so small that it does not matter, for instance, whether the target is 2 or ·2 metres east of the gun. This method of using the subtense formula fails if the angle S is less than 34′, since the S scale will read no lower in any straightforward way, but it has its advantages in a special case which we will come to shortly.

(b) We can use the Gunner's Rule and the A and B scales; this is Example 1 with a different "x". $\frac{26}{x}=\frac{m}{3438}=\frac{134}{3438}$ and x=670 as before.

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It is unfortunate that the tapes issued are usually marked in feet, whereas as things now are, we generally want the distance in metres; the slide rule will do the conversion for us if we like.

Example 6. How many metres in 85 feet? 85 feet = 28·3 yards. A metre is 1·09 yards; so $\frac{28{\cdot}3}{1{\cdot}09}=\frac{x}{1}$ and $x=26$.

The problem of finding from co-ordinates the bearing between gun and target (or any two points) is one which may not have to be done in urgent haste; but no one can object to its being done quickly. The slide rule does it in the time that it takes to look up one logarithm, and with an accuracy greater than the gun can use. To find the difference E and N we must be content to be, as Shakespeare puts it, "Scoundrels and Subtractors"; no slide rule can help us here; the ordinary formula is of course $\frac{\text{diff. E}}{\text{diff. N}}=\tan\theta$, but this is not its most convenient form for our purpose. Since the tangents are marked on the back of the C scale, we have to use the two lower scales, turning the slide so that the T scale is in front. (The notch at the back is a pitfall for all but the expert.) When we have so arranged matters it will be clear that the formula must be turned about until angles are above the line and distances below it; so $\frac{\tan\theta}{\text{diff. E}}=\frac{1}{\text{diff. N}}$. Even this will not quite do what we want, since tans are only given up to 45°. We cannot use angles greater than 45°, so we finally arrive at this formula:— $\frac{\text{T}}{\text{smaller difference}}=\frac{1}{\text{greater difference}}$. T is the angle we read over the smaller difference when we have put 1 over the greater; the only thing to remember is that T may be either θ or $(90-\theta)$, and that θ always belongs to diff. E. More fully, if the smaller difference is diff. E, $T=\theta$; if it is diff. N, $T=(90-\theta)$.

Example 7. A.T. II, page 199. Diff. E = 4388. Diff. N = 1934. Consequently $\frac{T}{1934}=\frac{1}{4388}$ and T = 23° 50′. Since we find T over diff N it is $(90-\theta)$ and θ must be 66° 10′. One final snag remains in that the T scale will not read below 5° 42′. The simplest way out of this is to use the Gunners Rule when the angle is too small, calling the smaller difference H and the larger R. An obvious difficulty here arises; how are we to know the size of the angle before we have found out what that angle is? A sufficiently

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accurate rule is that if the smaller difference is less than $\frac{1}{10}$ the larger, the angle is less than 5° 42′.

Example 8. A.T. II, page 275. Diff. E = 5916. Diff. N = 224. $\frac{\text{Diff. N}}{\text{Diff. E}} = \frac{m}{3438} = \frac{224}{5916}$ and m = 130′ or 2° 10′. Diff. N being the smaller, m = (90 − θ) and θ = 87° 50′.

Having found the bearing, it is usually required to find the distance between the two points. The ordinary survey formula we may rewrite in this way :— $\frac{D}{1} = \frac{\text{diff. E}}{\sin\theta} = \frac{\text{diff. N}}{\sin(90-\theta)} = \frac{D}{1}$. The $\frac{D}{1}$ has been put at each end to show that D will be found over whichever 1 comes into the picture. Sin θ is put under diff. E; as a check we see that diff. N is over sin(90 − θ); over 1 is the answer.

Example 9. Continuing Example 7. Diff. E is 4388 and θ is 66° 10′. So $\frac{4388}{66° 10'} = \frac{D}{1}$ and D = 48. Common sense gives the decimal point. Sin 66 is about ·9 (see Example 5), so D is rather more than diff. E and is therefore 4800. Over 23° 50′ (90 − θ) we find something like 1934, and feel safe from any gross error. Under present (and let us hope temporary) arrangements, this distance which we have found is in metres, whereas the gun requires yards. The metre-yard factor has already been given as 1·09, but a more convenient form of it here is $\frac{\sin 90°}{\sin 66°}$. So we put the cursor to 48 (which is still over sin 90), move the slide until 66 is under the cursor, and over sin 90 we find something like 5250 as the range in yards. The angle of sight is also wanted and this is given by the Gunner's Rule as in Example 1.

Example 10. Diff. H is 210, distance 4800, both in metres. $\frac{210}{4800} = \frac{m}{3438}$ and m = 150′ or 2° 30′ elevation.

The converse problem, co-ordinates from bearing and distance, requires the same formulæ; "x" is different since we know θ and D. Diff. H is found by the Gunner's Rule; but if the angle of sight happens to be above 34′ it can be found by using the sine instead of the tangent as in Example 5 (a), thus :— $\frac{\text{diff. H}}{\text{sin A. of S.}} = \frac{D}{1}$

It will be seen that this group of formulæ have $\frac{D}{1}$ in common. If D has been found by taping or rangefinder it is known; if by subtense we know how to find it (Example 5 a). We can therefore,

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as a rule, compute the co-ordinates of a gun from a bearing picket in one setting of the slide rule, thus :—

$$\frac{\text{Sub-base}}{\text{S}} = \frac{\text{diff. H}}{\text{A. of S.}} = \frac{\text{diff. E}}{\sin\theta} = \frac{\text{diff. N}}{\sin(90-\theta)} = \frac{\text{D}}{1}.$$

Of these fractions either the first or last is known, the three angles being also known we can read off the differences without further ado.

Example 11. (A.T. II, page 275).

$$\frac{9{\cdot}14}{2^\circ\ 49'} = \frac{\text{diff. H}}{38'} = \frac{\text{diff. E}}{51^\circ\ 26'} = \frac{\text{diff. N}}{38^\circ\ 34'} = \frac{187}{1}.$$

Put 2° 49′ under 9·14; over 38′ read 2·1 as diff. H. Run cursor to left hand 1 of S scale, since the other two angles are "off the map"; putting sin 90 under the cursor, over 51° 26′ read diff. E 146, over 38° 34′ read 116 which is diff. N.

Triangles may be solved by the slide rule; the formula $\frac{a}{\sin A} = \frac{b}{\sin B}$ is obviously suited to it, but generally, on the occasions when this type of sum has to be done by the gunner, the answer is wanted with more accuracy than the slide rule is able to give; there is plenty of time for logarithms.

For TOB the ordinary slide rule may not be the most convenient; but it can do it without much difficulty. It is best to regard TOB as a survey problem on an arbitrary grid; other ways of attacking TOB call for a certain amount of mental or digital dexterity, this is straightforward and brings in no new formulæ. Draw any triangle and letter it TOB. Consider OB as a grid north line; the angle TOB is consequently the bearing OT. Knowing the distance OT we can find the co-ordinates of T, giving any co-ordinates we like to O. The co-ordinates of B are obviously ±nil (easting) and ±OB (northing) with reference to O. We can now calculate the bearing and distance of T from B; knowing the bearing BO to be 180 we can find the angle TBO which we wanted and also the distance BT. The angle of sight at TOB can be obtained from the "Boot rule" (A.T. II, page 65); put in this form :— $\left\{\frac{a1 \times BO}{BT}\right\} + \left\{\frac{a2 \times OT}{BT}\right\}$ it is quite simple, and here perhaps the slide rule is unnecessarily refined; approximate arithmetic will give all the accuracy that TOB can be expected to produce.

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There is little to be gained by continuing examples, since they can be but the putting of problems into fractional form; if this idea has been understood it will have been realized that if there seems to be some mystery in the business when a "Slide Rule King" is seen at work, it is because much practice enables the quickness of his hand to deceive the ordinary human eye. In the days when medium artillery bore the more dignified name of Siege Train, a thing called the B.C's factor was mysteriously produced from slide rules by stolid soldiery, who could not have used a logarithm for any known reward; a recollection of this fact and an inherent inability to do a sum right amid the shouting and tumult of Captains and others induced this deponent to follow afar off those Slide Rule Kings to whose title he has no claim. To others similarly afflicted these notes may, perhaps, be of some assistance.

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THE STUDY AND ART OF MAKE-BELIEVE WAR.

By Bt. Major G. I. Thomas, D.S.O., M.C., *p.s.c.*, R.A.

IT is a matter for regret that so many officers are quite unacquainted with the contents of the little book which is to form the subject of this article. On first joining, the Junior Subaltern is under the dull necessity of mastering the "detail" laid down in the manual of his arm, coupled perhaps with an obligatory half hour in the Orderly Room conning Field Service Regulations. Young human nature, however keen, can perhaps scarcely be expected to read *Training and Manœuvre Regulations*, which the very title seems only to intend for his Seniors. The intricacies of turning out the guard, and the cares of his command, force into the dim distance the study of such advanced things as manœuvres. And so, this modest little book of 130 odd pages, if in his possession, is placed upon a book shelf, whilst the conscience is stilled by the thought that some day, amidst the ranks of the chosen, it will be taken down, carefully dusted, and absorbed at leisure.

Meantime our embryo Napoleon has doubtless become a very efficient regimental officer, commander of as good a platoon, or section, as any in the Army—results largely due to his own efforts. He has successfully got over his first and many subsequent lectures, but did he "speak naturally albeit slowly and distinctly"? Did he describe the advantages of P.T. "with earnestness and evident enthusiasm"? He will have attended Regimental Exercises and perhaps manœvres, filled with a healthy antagonism for the interference of the officer with two white bands, who so unfairly robbed his little command of their due share of glory. He may have inwardly scoffed at the civilian with the "white, with gold badge" arm band, who so unceremoniously stopped his efforts to beguile the tedium of trench digging by unearthing "antiquarian remains" from an old Roman burial mound. He may have wondered why the officer with the red and white badge expressed such concern at his eminently practical action of clearing a field of fire by levelling that old trimmed yew ornamental hedge. Yet the solu-

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tion of these and other kindred problems is easily found, and if the reader has had the patience to get thus far, perhaps his sympathy and interest for our hero will lead him to glance through the following review of *Training and Manœuvre Regulations.*

Chapter I. Principles and System of Training.

In this short opening chapter the object of military training is brought out much more clearly than in any other manual. The necessity for a doctrine is emphasized. A common point of view, an instinctive application of the principles of war, is essential for proper team work. It is indeed clear that only by constant practice in make-believe war, can you arrive at a stage where, in actual war, a commander can rely on any subordinates carrying out his orders, or instructions, in the way intended. Lord Esher in "The Tragedy of Lord Kitchener" (p. 53) pictures modern military thought as being antediluvian. He can scarcely have realized that the importance of continually looking ahead, both from the scientific and mechanical point of view, was actually to be written down in black and white. Further, that future war would be considered as a national one, demanding the activities of every part of the nation. Indeed this little sub-para. contains much food for thought anent the handling of experts and directing their efforts to the best advantage.

Whilst the responsibility for training is left with unit commanders, the squadron, battery or company spirit is fully recognized when these are referred to as "the basic training units."

The system of training, divided as it is into Individual and Collective is sketched, and the former sounds much more interesting when it is described, quite rightly, as consisting of those duties which the individual will actually carry out in war. Simplicity and interest are laid down as the keynote. This is a better basis than the monetary prizes of years gone by. At this distance it seems hard to imagine any results being achieved by a system aptly summed up in the following words of "Rifle Exercises and Musketry Instruction, 1879." "The distinctions and attendant pecuniary advantages liberally granted by the Government to those who excel in shooting are considered sufficient to stimulate the soldier to attain skill in the use of his rifle." *Sic transit.* A slightly modified

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system is outlined for the Territorial Army, depending as it must on conditions peculiar to that force. The defects of the present Bounty scheme are apparent, when we see that divisional exercises require special War Office sanction and "should be exceptional." Training memoranda are referred to and their object explained, whilst a useful warning is given against unofficial memoranda. These can only distract attention from official ideas. The chapter thus ends, as it begins, on the important note of "a common doctrine."

Chapter II. Individual Training.

Here we have the most important and the most interesting matter in the manual. The first eleven pages, besides laying the necessary emphasis on the importance of self-education, proceed to give the reader a very clear idea as to how to carry this out. Almost every possible means is dealt with. We are told how to read, what to read, and why to read it, and a very cogent answer is given to the critic who derides the study of military history. "Lecturing" is written on in a very human way, and contains excellent hints for the would-be speaker, or for the practised speaker, and even valuable for the after-dinner *raconteur*. Discussions, conferences, and the art of writing are all suitably treated, and the advice is a necessary preliminary to any more advanced instruction.

Exercises without Troops (small forces).

Under this heading we find a *vade mecum* to make-believe war, and as the importance of introducing the correct atmosphere into peace exercises is obvious, the suggested methods are deserving of the closest attention from all those whose duty it is to set, or to take part in, peace schemes of this nature. After describing generally the steps to be taken in the preparation and conduct of all exercises, and the best way of ensuring that real instruction is the result, the paragraphs in the training manuals on elementary exercises on the sand model, or on the ground, are elaborated. The uses and advantages of the sand model are well known, particularly in the Territorial Army where evening instruction is perforce the rule. Without trouble the sand model will convey

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little, except boredom, but the suggestions here should avoid that. A realistic touch can often be got if officers of other branches are invited to come and give their views as to how their arm, both friendly and hostile, would be employed.

The method of carrying out exercises with small forces of all arms is detailed fully, and when adhered to, produces satisfactory and comparatively vivid results. Though perhaps intended primarily as a guide to the direction of such exercises, a knowledge of the underlying ideas is very helpful. The importance of everybody getting "in the picture" and remaining "in the picture" is well brought out. The suggestion that solutions should be on paper, to prevent them being insensibly modified by other people's views, is perhaps not entirely unnecessary.

Exercises without Troops (considerable forces).

Being, as they frequently are, exercises of considerable scope, the duties of the directing staff and all the preliminary measures are dealt with at some length. This even includes a clear guide to what is required at hotels and for getting about on the ground. After dealing with the preparation and issue of the scheme, some three pages are devoted to "appreciations." This is good and finds no place in any other manual. At the close of the operations the advantages of time for retrospect are well pointed out. No amount of talking compares with the value of an hour's quiet thought over the various conundrums which have cropped up.

Indoor exercises can be conducted on the same lines, and can afford practice in working against the clock. Here there is an unobtrusive sub-para. on schemes based on actual operations in war. Where the directing officer is thoroughly up in the details of what occurred, such schemes produce, in a way no imaginary ones can, the mistakes that can be and are made in the stress of fighting. For this reason they are especially interesting and instructive.

War Games.

These afford an opportunity for indoor study of strategical, tactical, staff or administrative problems. They are not suitable

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for instruction in minor tactics and rarely continue once the main bodies are closely engaged. The method of conducting them is an interesting study and is fully set out.

Chapter III. Collective Training.

"To achieve success an army in the field must be able to move rapidly, to strike effectively and to resist stubbornly," and as this is the object of collective training, this chapter covers the whole field of training, from that of the smallest sub-unit to divisional and command training. Army manœuvres are dealt with separately.

The general instructions cover some four pages and contain many ideas for the ground work of schemes, the preparation and conduct of which is then described. Squadron, battery or company training away from barracks is well written on, and includes a list of practically all the arrangements to be made beforehand. This is most helpful, and a knowledge of all the points raised would save many a harassed officer from the annoying claims which so frequently follow this form of training. Various kinds of special exercises are noted, and a useful para. deals with billeting schemes. Two pages are devoted to the action of a skeleton force. These deserve study. The command of a skeleton force is never an easy job, and can be a very fatiguing one.

Chapter IV. Army Manœuvres.

Although this deals chiefly with the preparation for, and conduct of, manœuvres and the duties of the directing staff, there is much that all officers taking part should know. This knowledge would certainly stimulate interest and efficiency, and might save considerable inconvenience. After all "the success of manœuvres depends to a very great degree on the regimental officers." There are certain rules which are laid down to assist the art of make-believe, and others which must be known if the cost of manœuvres is not to be prohibitive, and the manœuvres themselves, and hence the army, to become intensely unpopular with the countryside. No one would dream of playing football without being thoroughly conversant with the rules. At manœuvres there are more ways than one of putting the other fellows "off-side."

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Chapter V. Umpiring.

Everyone will admit that it is extraordinarily difficult in peace to produce the atmosphere of war. Most people will also concede that, unless an attempt is made to paint the conditions of war, no useful training can be carried out in peace. Hence the umpire. The details of the duties and qualifications of the good umpire are multifarious and difficult. It is only, indeed, by understanding them that regimental officers can treat the umpire in the proper perspective. The duties of each *vis-à-vis* the other are therefore carefully explained. After all the regimental officer is out to learn, and he will get the best results by knowing the lines on which the umpire is out to help him.

Appendix "A" to "G".

In the Appendices is to be found a précis of the Military Manœuvres Act and the points which require to be noted by all ranks. Here are the arrangements for compensation, and the method by which the man whose gate-post you knock down can claim the wherewithal to repair it. The temperature of the welcome, and the subsequent standard of comfort, is appreciably raised if this can be explained. There is a specimen form of agreement for hiring land, and another specimen form which can be filled up to turn the most exposed position into an impregnable redoubt.

Unlike other Service Books, which lay down the Art of War, "Training and Manœuvre Regulations" show you how to learn the Art of War. It is easy to read, and not abstruse, while it contains a great proportion of the information for which the crammer charges five guineas a week.

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THE 'HONOUR' TITLES OF BATTERIES IN THE ROYAL REGIMENT OF ARTILLERY.

By Major (Bt. Lieut.-Colonel) J. H. Leslie.

I.

'DRAGON.'

[M.A.R. = Madras Artillery Records.][1]

FOUR Field Batteries, as shown below, which formerly belonged to the Madras Army of the Hon. East India Company, bear this 'Honour', which was granted for the War with China of 1841-2.

Designation in 1930.	Designation in 1843.
Field Battery, R.A.	Madras Artillery.
'P' — 'Dragon Troop'.	'C' Troop, Horse Artillery.
48th, 50th, 51st — 'Dragon'.	'D' Company, 3rd Battn., 'B' do. 2nd do., 'C' do. do. do. — Madras Foot Artillery.

[M.A.R. 'Regimental Intelligence.' 1843. pp. 918-9.]

The following General Order, No. 199, by the Right Honourable the Governor General of India in Council, Fort William,[2] 15 September 1843, is republished for the information of the Army of this [Madras] Presidency:—

The Governor General in Council having taking into consideration the good conduct of the Troops and of the several Companies specified in the margin,

['C' Troop, Madras H.A.
'B' and 'C' Companies, 2nd Battalion, Madras Foot Artillery.
'D' Company, 3rd Battalion.
'A', 'B', and 'F' Companies of Sappers and Miners.
Flank Companies of the 41st Madras Native Infantry.]

before the City of Chinkiang,[3] as represented by His Excellency

[1] There is a complete set in the library of the Royal Artillery Institution, Woolwich.
[2] Calcutta.
[3] At the mouth —south shore—of the Yangtse Kiang, Lat. 32° 10′ N., Long. 119° 30′ E.

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General Sir Hugh Gough, G.C.B.: is pleased to grant to the Officers, Non-Commissioned Officers and Privates, of such Troop and Companies, the same distinction which was accorded in G.O.G.G. dated the 14th October, 1842, to the 2nd and 6th Regiments of Madras Native Infantry, and to the Rifle Company of the 36th Madras Native Infantry, similarly engaged namely, that of bearing hereafter upon their Appointments, a golden Dragon wearing an Imperial Crown.

Her Majesty having been graciously pleased to grant to Her Majesty's Regiments engaged in the War with China the honour of bearing, inscribed upon their Colours and Appointments, the word "China"; with the Device of the "Dragon", the Governor General in Council accords to the Regiments of Madras Native Infantry and to the Troop, and the several Companies specified in the margin,

['C' Troop, Horse Artillery.
'B' and 'C' Companies, 2nd Battalion } Madras Foot
'D' Company, 3rd Battalion } Artillery.
'A', 'B', and 'F' Companies, Madras Sappers and Miners.
2nd
6th
14th
37th } Regiments of the Madras Native Infantry.
Rifle Company, 36th Madras Native Infantry.
Flank Companies, 41st do.]

the honour of bearing the word "China" inscribed upon their Appointments, the Regiments bearing that Inscription also on their Colours; and such Regiments above specified as have not already had accorded to them the honor of bearing upon their Colours and Appointments, the golden Dragon wearing an Imperial Crown, will bear thereon the device of the "Dragon" as borne by Her Majesty's Regiments, for service in the War with China, in which the several Regiments and the Troop and Companies above specified, had the good fortune to be engaged in co-operation with Her Majesty's Troops.

(Sd.) EDWD. SANDERS,
Offg. Secy. to the Govt. of India,
Mily. Dept.

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It is not known how the 'honour' was worn by the Foot Artillery Companies, but the following extract from the Madras Artillery Order, No. 800, of 11 June, 1844, explains the method of wearing by the Horse Artillery (M.A.R. of 1844, p. 1017) :—

With the sanction of the Most Noble the Commander-in-Chief; the following alterations and additions in the Dress and appointments of the Officers of the Horse Brigade are to be adopted.

ALTERATIONS.

2d. A round Waist Plate is to be substituted for the present one, the Plate to fasten into a ring of $1\frac{3}{4}$ inch in diameter, the ring is to have the words "Horse Artillery" on it, and the plate to bear the Company's[1] Arms on a frosted ground—Officers of the C. Troop are to wear on the plate instead of the Company's Arms a Gilt Dragon wearing an Imperial Crown.

ADDITIONS.

1st. Breast Plate—Officers of the C. Troop will wear on the Breast plate, a Dragon wearing an Imperial Crown, and on the Dress Pouch Belt the word "China" is to be worn between the Breast Plate and Nagpore.[2]

4th. Saddle Cloth.

Officers of the C. Troop to wear at the front points of the Saddle Cloth, a Golden Dragon wearing an Imperial Crown.

The "Dress Regulations" of the Madras Artillery (M.A.R. of 1842, pp. 763-78), should also be referred to.

The Officers of the Madras Artillery who served with the China force in 1841-2 are set forth in M.A.R. of 1842, p. 679, and of 1843, p. 874.

[N.B.—The figures given in brackets after Officers' names, refer to Leslie's List of Officers of the Madras Artillery, published in 1900.]

Lieut.-Colonel Patrick Montgomerie, C.B. (309) Commanding.
Major Frederick Blundell (336),
Commanding 2nd Battalion and Artillery reinforcements proceeding to China.

[1] i.e. Of the Honourable East India Company.
[2] All Officers of the Madras Horse Artillery wore the battle honours "Java", "Mahidpoor, and "Nagpore" on the pouch-belt.—See illustration.

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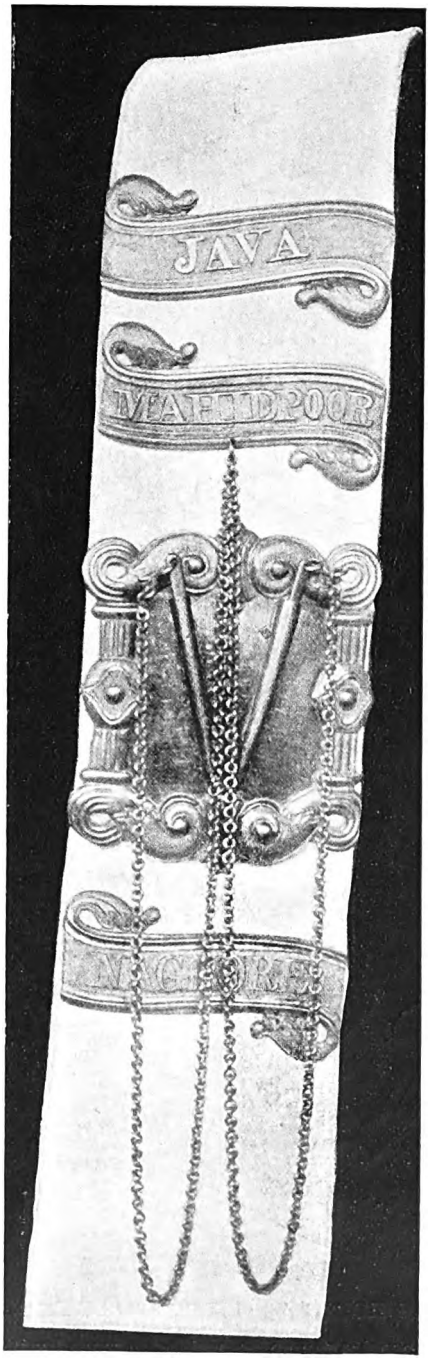

POUCH BELT.

Madras Horse Artillery.

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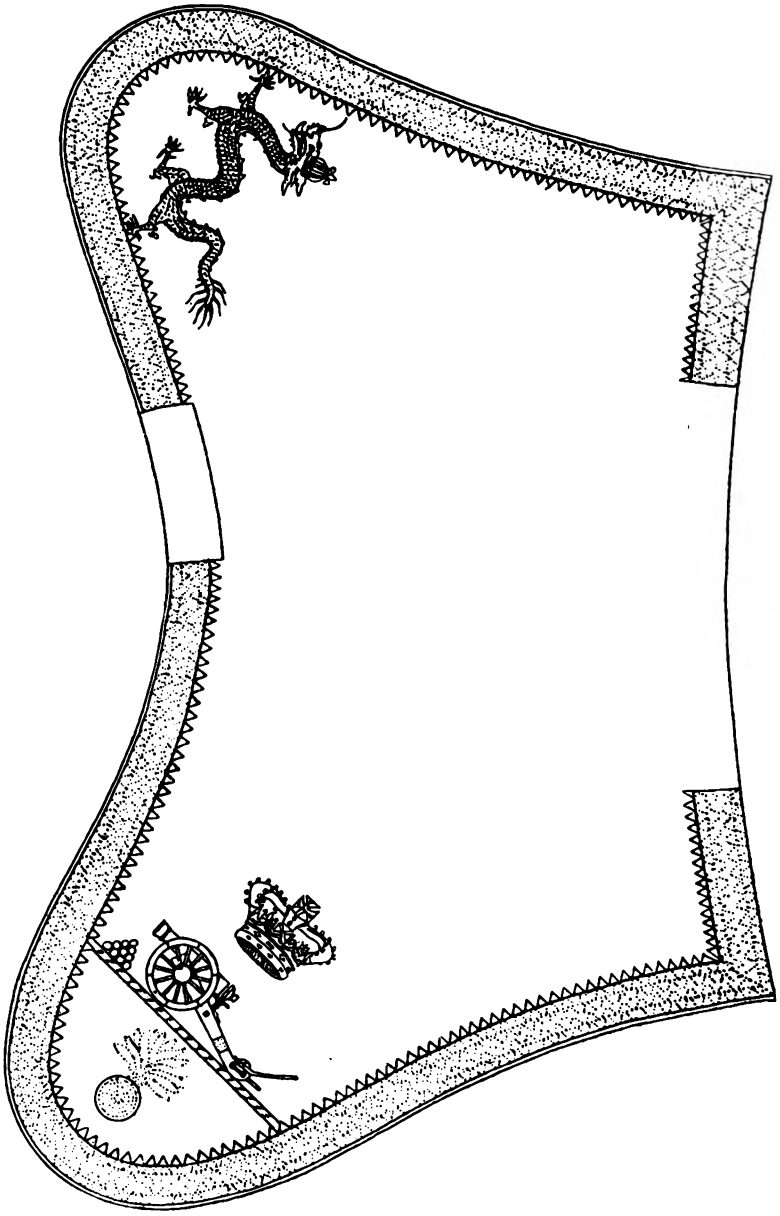

MADRAS HORSE ARTILLERY SADDLE-CLOTH

Showing the Chinese dragon on near side, as worn by "C" Troop only.

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'C' Troop, Horse Artillery.

Captain George Hall (397).
Lieutenant Richard Kinkead (469).
do. Andrew William Macintire (484).

'B' Company, 2nd Battalion.

Captain (Bt. Major) Philip Anstruther (398).
2nd Lieutenant Hickman Thomas Molesworth (503).

'C' Company, 2nd Battalion.

Captain Richard Cornwallis Moore (399).
Lieutenant Wyndham Charles Leopold Baker (498).

'D' Company, 3rd Battalion.

Captain John Back (382).
Lieutenant Ronald Macpherson (497).
2nd Lieutenant Carleton Thomas Collingwood (509).
do. Charles Douglas Waddell (510).

These Officers belonged to 'C' Troop and to the Companies, as shown.

Attached from the Horse Brigade.

Lieutenant Archibald Foulis (486)
do. Alexander Todd Cadell (496)
2nd Lieutenant George Scott Elliott (504)
} Doing duty with the 2nd Battalion Companies.

Lieut. (Bt. Captain) George Balfour (421). Staff Officer.

2nd Lieut. Alexander Stewart (511) Comdg. 'A' Company
do. Thomas Bernard Cox (512)[1] Comdg. 'B' Company
} China Gun Lascar Establishment.

The Portrait of Lieutenant H. T. Molesworth, who served with 'C' Company, 2nd Battalion, in the China War—see above—is reproduced from a crayon drawing, taken at Bangalore in 1852, he then being adjutant of the Horse Artillery. It shows with great clearness, what the full dress uniform of the Madras Horse Artillery was at that time.

Much information regarding artillery affairs, letters, orders, dispatches, etc., in this war will be found in M.A.R. of 1842 and 1843.

(To be continued.)

[1] When the force returned to India in 1842, was left at Singapore, sick, where he died on 16 January, 1843.

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INSPECTION—ITS PRINCIPLES AND PRACTICE.

By Major O. F. G. Hogg, *p.a.c.*, R.A.,
F.R.S.A., C.I.Mech.E., M.I.E.I.

General.

INSPECTION may be defined as the art of securing serviceability by reducing the risk of failure in the product inspected. Such a risk cannot be entirely eliminated as a complete inspection would result in the destruction of the material under test and so defeat its own object, but it can be, and is, diminished in proportion to the thoroughness and efficiency of the examination undertaken. The extent of inspection, therefore, which can in any particular case be considered sufficient, depends upon the probable results of failure, either financial or political, should failure occur.

Manufactured goods can be clearly divided into two classes. Those which are entirely harmless under all circumstances, and those the failure of which is a definite source of danger to the user or the general public. In the former case the results of failure are purely financial, and the required degree of inspection is determined by a contractor's ability to sell his products, i.e. by his market, and the experienced manufacturer is one who knows the minimum effort required in this direction to safeguard his sales. In the latter case, where life may pay the penalty for faulty material or workmanship, the question of policy looms up with greater magnitude than that of finance. The effect of some national disaster may, and undoubtedly would, be more far-reaching than that called forth by financial considerations alone. Political or commercial extinction, owing to the loss of public confidence, is of a more bitter and lasting character than a Treasury deficit or a depreciated bank balance.

The political consequence of such a failure, depending as it does upon the national psychological outlook, will naturally vary in every country. There are many nations and in some human life is of small account. It may therefore be taken as an axiom that the standard of sound inspection in a country depends upon

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the maximum number of fatal accidents deemed politic in the balance between immunity and economy. Inspection is thus seen to be governed by expediency, and to be determined in every case by considerations of policy or finance.

Scope.

In dealing with simple commodities which are, in themselves, complete, the terms *serviceability* and *function* can be regarded as synonymous, e.g. a whistle which emits the correct note when blown may be pronounced serviceable. When, however, products which form only a part of a compound article come under consideration a different problem arises. Such examples as gear wheels, springs, motor tyres, etc., the utility of which lies not in their essence, but in their associative capacity with other components to form a synthetic whole, show us that function is not the sole criterion of perfection. The best motor tyre in the world is valueless if it cannot be fitted to any known make of rim or wheel; the finest hair-spring is merely a waste of effort if it cannot be utilised in any clock; the soundest of sound boots are simply an encumbrance to their owner if they are too small for his feet.

The question of fit, therefore, becomes of paramount importance, and unless every composite store is, figuratively speaking, to be made on an individual last, each of its constituents must, within engineering limits, be similar in order to allow complete freedom of choice in assembly. In other words similar parts must be interchangeable. Serviceability, therefore, in its widest sense, must embrace interchangeability and any sound system of inspection must guarantee this property as well as the power of function.

The degree of interchangeability considered expedient is a matter of policy and depends upon :—

(a) Methods of manufacture.

(b) The amount of local repair deemed feasible by the fitting of new parts.

In this commercial age when competition in price-cutting is the order of the day, mass production for articles in common use is the best method of ensuring a high return on capital, and for mass production to succeed complete interchangeability and consequent heavy inspection charges must be accepted; there is

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no short cut to the manufacturer's paradise—high output at low cost.

A typical case is the popular model of a car where the actual vehicle, rapidly put together, is an amalgam of hundreds of parts drawn from a common pool. Under such circumstances interchangeability must be a *sine qua non* unless the firm wish to go out of business.

This method of production allows a vast number of spare parts to be distributed among local garages and repair shops over a wide area. This, in itself, enhances the value of the machine in the eyes of the public, and a prospective buyer will gladly purchase and put up with a possibly inferior product if he can be certain of easy replacement when parts become worn out or damaged. Without a thorough system of inspection, therefore, a business which sets out to capture the market would, under modern conditions, fail to achieve its object.

Aspects.

So far we have been considering inspection entirely from the point of view of the producer, i.e. of the factory view branch, which must perforce inspect and check production at every important stage of manufacture in order to ensure a minimum amount of final rejection with its consequential waste of labour and material. There is, however, the other aspect of inspection, far more important from the Service point of view, namely that by or on behalf of the purchaser by which he can be assured that he is obtaining the goods for which he pays. It is almost a truism to state that such an inspection must be carried out by a body entirely independent of manufacture, not only technically but financially. This principle, however, was not recognised by the War Department until the late eighties. In 1887 a Committee, presided over by the Earl of Morley, was appointed to enquire into the organization and administration of the manufacturing departments of the Army. It reported in July 1887 and one of its recommendations was couched in the following terms:—

> "An Inspector-General of Warlike Stores should be appointed, who should report direct to the Surveyor-General of Ordnance. All weapons of war and stores

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supplied to the Army from the Government factories or from the trade should be inspected, tested and passed under his direction and on his responsibility."

This policy was adopted and the Inspection Department came into being on 1st April, 1888, since which date the inspection of stores for Army purposes has been absolutely divorced from manufacture, both as regards supplies from Government sources and from the trade.

SYSTEMS.

There are, broadly speaking, two systems of procedure possible when inspection is to be undertaken by an independent authority. These are :—

(a) Inspection throughout manufacture.

(b) Inspection at the completion of contract.

At first sight the former system may seem an unwarrantable refinement from the financial standpoint, as a staff, whose duty is limited to finished inspection, will obviously be smaller and less costly to maintain than one whose functions include the gauging and testing of material throughout the complete run of work.

It may be argued that this responsibility is not only primarily, but entirely, the concern of the contractor, and that as the purchaser is only interested in the ultimate serviceability of the articles purchased he is voluntarily choosing to incur expenditure which should rightly fall on the manufacturer if the latter wishes to guard himself against loss. The argument appears to be even stronger when Government stores are at issue, since a contractor's liabilities are purely a matter of domestic policy, and as the prices he may charge to insure himself against losses of this nature are strictly controlled by the method of purchase, i.e. by open tender, he must keep them down to a minimum. Acceptance or rejection by final results, therefore, should tend to stimulate business efficiency.

This argument, however, contains a fallacy and one moreover which is apt to be overlooked. It ignores the fact that if the work is to be completed and the goods delivered under the terms of the contract this meticulous inspection must be carried out, and

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so if the inspecting authority should stand aside the manufacturer must undertake it himself. Experience proves that a firm's inspection invariably costs more than that undertaken by Government, and that such expenses are recovered by raising prices. The country therefore loses in the long run.

There are, however, other cogent reasons why inspection during manufacture should be in the hands of the purchaser or his agent. They are as follows:—

(1) The contractor is kept on the right path and given the opportunity of rectifying errors at every important stage. His total number of rejects will thus be kept low and the numbers acceptable at the finish of a contract fairly accurately determined. This tends to stabilize prices and ensure supplies.

(2) It is obviously preferable for this inspection to be carried out by the purchaser as the product will come under close scrutiny throughout its manufacture.

(3) It teaches the inspecting authority where pitfalls in manufacture exist and where points of weakness are likely to be encountered. The knowledge thus acquired is of the utmost importance for guiding inexperienced firms who may have to be pressed into service during a national emergency.

(4) The records obtained from such a thorough and systematic inspection are invaluable in tracing, explaining and guarding against failures that may occur in subsequent manufacture or use.

Types.

Inspection may be of two kinds:—

(a) Percentage examination,

(b) 100% examination,

and the question of deciding which type should be adopted in any particular case, bearing in mind all the factors involved, function, interchangeability, importance, cost, etc., depends upon the store in question. It may be taken for granted that a cheap article is of little importance, i.e. its failure, should it occur, would not be serious. It is also logical to presume that the cheaper the

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commodity to produce, the more expensive, in proportion, it is to inspect. Cheap tin stampings, used as lids for cardboard containers will, if they are to be gauged, cost more to examine than they will to make. It is obviously more advantageous to sacrifice a few per thousand for failing to fit than to examine the whole consignment. Hence sentencing on a percentage examination is clearly indicated in this class of work. A reasonable figure for the cost of inspection is 5%, i.e. such costs should not exceed 5% of the purchase price of the article inspected. On the other hand stores which are complicated, and therefore expensive, or those the failure of which would have unpleasant consequences call for a 100% examination.

METHODS.

Five methods of inspection exist. These consist of:—

(1) Visual examination.
(2) Gauging and measuring.
(3) Chemical analyses, mechanical and performance tests.
(4) Proof (in special cases only).
(5) Radiological examination (considered later).

The first two methods can be applied to 100% of the stores undergoing inspection, and the percentage of articles which should be examined under these headings is governed by the requirements of interchangeability, methods of manufacture, knowledge of the number of failures probable, etc. Tests and proof cannot of course be carried out in every case, since these forms of inspection imply in many instances destruction to the article tested. Such methods, therefore, can only be applied to a few samples in every batch of goods undergoing inspection, the numbers in every case being based on previous experience of failures, either in respect to the store itself or to a particular maker.

The relative importance between an inspection comprising visual examination only and one which includes gauging and measuring depends to a large extent on the method of purchase. Before gauging and measurement can be undertaken the inspecting authority must be in possession of a complete set of drawings and/or specifications. When stores are bought to the purchaser's own design these must be held in order to guide tender and

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ultimate purchase, but should the articles required be of a trade pattern in contradistinction to a trade supply the inspecting authority may, and probably will, be without such particulars. The prospective purchaser must then be content with buying such articles direct from their normal maker without going to open tender, and be satisfied with a visual examination for workmanship and finish only.

Such a visual examination is comparatively cheap and is probably the most suitable method to adopt when buying proprietary articles. A guarantee is to a certain extent afforded by the fact that as the particular purchaser in question is buying stores from the same run of work as other users, faulty material is equally likely to find its way into the hands of all buyers. The safeguard, therefore, is the possibility of damage to the maker's reputation in the eyes of the public. The only alternative is to purchase by open tender at a competitive price. This entails a complete inspection and is dependent, as before stated, on the provision of all working drawings and gauges, an undertaking entailing great expense. Undoubtedly, therefore, the risk of an occasional failure is more than compensated by the cheapness of inspection, and the most economical method of purchase in the case of a proprietary article is from the recognised firm itself.

Government Inspection.

Inspection of Government stores for the three fighting services is carried out independently, the organization in each service differing in its details.

In the Navy, the inspection of all armament stores, i.e. guns, mountings, ammunition (except small arm) is undertaken by the Chief Inspector of Naval Ordnance at the Admiralty assisted by Inspectors of Naval Ordnance at Woolwich, Sheffield, and other centres. The Chief Inspector of Naval Ordnance together with the Chief Superintendent of Armament Supply are under the jurisdiction of the Director of Naval Ordnance. The Director of Stores, Admiralty, is responsible for the supply and inspection of other stores, including mechanical transport required by the senior service. Ships and shipyard repairs are inspected by officials under the Director of Naval Construction, the Engineer-in-Chief, and the Director of Electrical Engineering.

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In the Air Ministry, all inspection is under the Director of Aeronautical Inspection. He has four deputies on his staff who share the total responsibilities between them. These are the Chief Inspector of Aircraft, the Chief Inspector of Engines, the Inspector of Armaments and the Inspector of Stores.

In the Army, the Master-General of the Ordnance is responsible for the supply and inspection of all stores for military purposes, except mechanical transport vehicles driven by R.A.S.C. personnel. The latter are maintained under the Director of Supplies and Transport and inspected by the Chief Inspector of Mechanical Transport, functioning under the Quartermaster-General. The Master-General of the Ordnance controls six independent inspection departments as under:—

(1) The Chief Inspector of Armaments who is responsible for the inspection of all armament stores, viz.:—guns, carriages, ammunition, both gun and small arm, tanks, armoured cars, pyrotechnics, anti-gas apparatus, optical supplies and mechanical transport vehicles other than those manned by the Royal Army Service Corps.

(2) The Chief Inspector of Small Arms who is responsible for the inspection of all small arms, viz.:—rifles, machine guns, bayonets, pistols, swords, bicycles, etc.

(3) The Chief Inspector of Royal Engineer stores who is responsible for the inspection of all R.E. signalling and wireless stores.

(4) The Inspector of Stores who is responsible for the inspection of general stores, i.e. of those other than warlike.

(5) The Inspector of Clothing who is responsible for the inspection of all Army clothing.

(6) The War Department Chemist who is responsible for the inspection of all chemicals, oils, paints, varnishes, explosives in bulk, etc.

Of these the largest in point of view of size and activities is the Armaments Inspection Department.

This Department is responsible for the inspection of all new armament stores supplied to the Land forces and, with the exception of those off contracts placed by the Air Ministry direct, of similar stores purchased on behalf of the Royal Air Force; it is

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also responsible for the inspection of new small arm ammunition for the naval service. In addition, the examination of reserve army stocks, the examination, and if necessary the proof, of special consignments of stores already in the service and the inspection of those of an exceptional or experimental nature are also undertaken. In addition, inspection of new work for the Governments of India or other Dominions is carried out at their request.

Other duties of the Department consist in preparing specifications for armament and M.T. stores, except those dealing with explosives in bulk, oils, paints, varnishes, etc. (the responsibility of the W.D. Chemist), the sealing and safe care of all specifications and drawings, the custody of sealed patterns and negatives, the production of prints and the preparation of instructional and wall diagrams. The Department is also responsible for the design and inspection of its own gauges, the design, repair and experimental work in connection with certain optical stores such as coast-defence and anti-aircraft instruments, and for experimental S.A.A. work on its small arm range; furthermore the Department deals with all Approvals and correspondence relating thereto. Every store has to conform to type, the details of which are set out in its sealed drawing and sealed specification. The original design, and any subsequent modification it may undergo, has to be authorized by the Director concerned at the War Office and such authorizations are known as "Approvals". The Department also deals with contract demands and tenders, distributes specifications to various other departments and Dominion offices, notifying the holders of any subsequent amendments to the same, and assigns nomenclature for all three services to the following types of stores:—

Guns, mechanism, etc.
Carriages, mountings, vehicles, side arms.
Tanks, dragons and tracked vehicles.
Ammunition.
Optical supplies.

Finally the Department is charged with the preparation of the following books and pamphlets:—

Handbooks of all equipments including those for tanks and dragons.
The Care and Preservation of Artillery Equipments.

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Magazine Regulations.
Identification Lists.
War Equipment Tables.
R.A.O.S. Part II.
Priced Vocabulary of Stores (with the exception of the actual pricing),
and
List of Changes (monthly), for all services.

In order to carry out this work the Armaments Inspection Department is divided into a Headquarter staff and six Divisions, namely the Inspectorates of Guns and Carriages, Gun Ammunition, Small Arm Ammunition, Tanks, Mechanical Carriages and Optical Stores. Each Inspector deals with his own special problems, the common services, such as the printing of drawings, the maintenance of the test house, the supply of gauges, etc., being grouped under the Headquarter staff.

Since armament stores are in all cases warlike there may be said to be few which are of a trade pattern, although in certain cases, notably in the Optical Section, they are bought from the trade. There must, therefore, be a complete set of drawings and specifications in practically every case to govern supply. This entails the custody of about 100,000 drawings and negatives and some 3,800 specifications. As stores are constantly undergoing slight modifications based on experience gained in the field, there is no need to stress the enormous labour involved in keeping such negatives and specifications up to date. Owing to this possibility of frequent change no stock (except special sets for departmental reference) of drawings is kept and, therefore, every time copies are required to guide tender, contract, or for any other purpose they have to be printed. These demands run into something like 20,000 prints a month. The printing room therefore is a hot-bed of activity.

The amount of inspection deemed desirable depends, not only on the store in question, but also on the method of purchase. The probability of more than one manufacturer being concerned in the production of a service store, especially ammunition, must be considered. This division of manufacturing responsibility means that a more detailed examination, than is perhaps otherwise

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necessary, is essential in order to clear one contractor before his handiwork is handed over to another for completion. It is obviously quite impossible to hold the chemical industrialist, who undertakes filling, responsible for the failure at proof of the filled store when the fault lies at the door of the engineer who made the empty shell or fuze in question. Modern rationalization of industries, therefore, under which work undertaken by groups of factories tends to become standardized, does increase the amount and consequent cost of inspection to a degree unnecessary in the last century.

The value of interchangeability has already been outlined, and in dealing with complicated stores such as gun carriages, tanks, etc., this property becomes of paramount importance in the Service for two reasons: firstly, from the point of view of the user and, secondly from the standpoint of ease of supply in an emergency. A few examples may help to elucidate these points.

Guns in a battery on service become damaged. Under present conditions it is possible to build up one complete and serviceable weapon from the parts of two or more damaged pieces.

A certain portion of a gun carriage or tank requires replacement. Under existing arrangements a new component can be demanded from store and fitted by the local artificer.

An interesting experiment was once carried out in this connection. Five 18 pr. Mark V guns and carriages were taken from store. These were stripped down, the parts mixed and five equipments assembled again from the pile of components without any selection or fitting. The guns were then fired and found to function satisfactorily and accurately. When it is stated that this particular carriage has 457 parts, the amount of care inolved in accurate measuring and gauging becomes colossal, and it is necessary to design and manufacture 264 gauges and to carry out 3037 gauging operations in order to ensure this result in this one type of carriage alone.

Expanding this principle to cover the several thousand stores inspected, the gauge problem assumes large proportions. Quite apart from the aspect of design which, in itself, calls for ingenuity and skill, is the question of supplies. Gauges are expensive, and unless they are forthcoming in sufficient numbers at the com-

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mencement of hostilities the output of munitions will suffer. When stores become obsolete the corresponding gauges in 99% of cases become scrap. Money is far from unlimited. With these conflicting factors to reconcile the size and details of a gauge reserve, necessary in peace to cope with an outbreak of war, is a problem which requires much forethought and care to obtain a satisfactory solution.

If an increase in numbers is suddenly called for the sources of supply are difficult to tap. It goes without saying that gauges must be accurate, call for special skill and experience in their manufacture, and cannot be readily turned out in an ordinary engineering works. Since service gauges are useless for trade purposes suitable plant must be provided especially to make them, and, therefore, the firms who do specialize in this class of work must obtain sufficient orders in peace in order to enable them to maintain their plant. Such jigs and tools as may be necessary to complete an order add considerably to its price, and therefore the smaller number of gauges required the more expensive each becomes. Gauge reserve policy is therefore hedged around with financial considerations.

Interchangeability becomes of vital importance when considering the supply of stores to an army in the field. The abolition of such a principle would entail an enormous increase in the number of large stores such as guns, tanks, etc., to be supplied, which would in turn enhance the difficulties of storage and transportation necessitating in all probability an augmentation of railway services.

Two examples of the necessity of interchangeability from the manufacturing point of view will suffice.

Time fuzes are manufactured by the thousand on automatic machines, different portions being machined out in various shops and often in separate works. Certain of these parts have to go to a filling factory to be filled. They must be accurate enough to fit the filling machines and presses and to take the filled components. All these constituents must go together without selection or alteration on assembly, and the finished fuze must function accurately.

During the late war various small firms, scattered throughout the country, made the several parts of the service rifle under the

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peddle scheme. These components were sent to the R.S.A.F., Enfield Lock, where they were stored in a "pool" from which rifles were built. At one time these "peddled" rifles approximated 2000 a week and helped very considerably to increase supplies to the British Army.

It is quite impossible, in an article of this length, to enter into details regarding the inspection of every kind of store. Even the *Encyclopædia Britannica* would hardly be large enough to contain all the relevant matter. But a short account of the operations considered necessary in the inspection of a few representative examples will show how the principles already touched upon are put into practice.

Gun inspection commences at the steel-maker's works where examiners watch the manufacture of the steel. They witness the pouring of the ingot, together with the taking of the discard, and select drillings for chemical analysis. The ingot is then finally examined and marked. The scene then shifts to the gun-maker's works where examiners superintend forging, oil-hardening and tempering and take test pieces for mechanical tests. After rough machining an examination for flaws takes place. Finish turning is then carried out after which measurements, both inside and out, are obtained. Wiring is now watched, a check being maintained upon the tensions under which the wire is wound. After wiring, internal and external measurements are again taken. Other portions of the gun, such as the jacket and breech ring, are also carefully scrutinized during manufacture. The building of the gun is finally closely observed to ensure correct shrinkage and positioning, and the various parts are tested to gauge, the mechanism fitted, the bore measured and impressions taken. Proof is then carried out. After proof the gun is re-measured, further impressions being taken for comparative purposes. The mechanism is then disassembled, each component being fitted in the model breech block and the model components in the service block. The gun and mechanism are then finally assembled.

The inspection of a carriage begins with the mechanical testing of the materials composing it. These must be taken from the rough bar or forging after any prescribed heat treatment has been carried out, but before any machining operations have been com-

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menced. Accepted parts are then stamped with the acceptance mark, which remains on the steel throughout manufacture, in order to guarantee that the finished article has the required degree of strength. All parts are then guaged, the carriage built up, and the buffer and recuperator system charged. The recoil and run-out is tested by pulling out and releasing the gun. The assembled carriage is next subjected to proof during which recoil is carefully observed. After proof the carriage is partially dismantled, each part is visually examined for cracks, flaws, breakages, etc., and the more important components, which are known to be likely to be affected by firing stresses, are again gauged and measured. The carriage is then re-assembled and the sights tested for alignment.

The inspection of shell commences at the steel maker's and forge master's works where particular attention is paid to pouring, re-heating, discarding, rolling, forging, etc., in order to ensure that the necessary conditions are being observed. Test pieces are selected on a percentage of forgings as a check on a particular billet. Preliminary machining operations then take place followed by a preliminary examination, in order to ascertain whether further work is warranted. After completion the shell are delivered in lots for the main examination, each lot consisting of shell which have been made, as far as possible, under uniform conditions and which are governed by the same mechanical tests. Samples for proof are selected for each lot, examined and fired. If they pass proof satisfactorily the detailed examination of the lot is proceeded with. This consists of a large number of gauging operations at salient points. The shell when finally accepted are sent for filling. A further proof to inspect the filling is carried out. The shell are then finally painted, gauged and passed into the Service.

Small arm ammunition is never inspected during manufacture, and, in this respect, differs from other armament stores. The reason is not far to seek. The price of a round, in the region of 1½d., does not allow of such an exhaustive system of examination. A lot usually consisting of 200,000 rounds is, as a lot, accepted or rejected on the results of proof, i.e. it is subjected only to a performance test. Proof consists of firing a certain number of rounds per lot for accuracy, velocity, pressure, casualties, hang-fires, etc. If the lot should pass proof, the rounds are first weighed

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and gauged on automatic machines specially designed for the purpose. They resemble, in principle, those in use at the Royal Mint for weighing bullion.

Light and heavy cartridges are rejected by these machines and rounds which are too large or of incorrect length are eliminated. As a safeguard all cartridges rejected by the machines are re-weighed and re-gauged by hand. Cartridges which have satisfactorily passed through the machines are then visually examined for defects, such as scaly metal cases, defective caps, missing caps, split necks, scored cases, defective bullets, etc. This examination is carried out in two parts, the preliminary being done by examiners who eliminate any cartridge considered in the least degree doubtful. These cartridges are then re-examined by more skilled examiners who finally decide on acceptance or rejection, and sort out the rejects in various categories, including those cartridges which have been rejected by the weighing and gauging machines. The accepted ammunition is then packed as required.

The problems attendant upon the inspection of mechanical transport, are, from the Service point of view, of a simpler nature. Vehicles are, in the majority of cases, of a standard trade pattern and therefore the questions of gauging, testing, etc., which loom so large in armament work, do not arise. Examiners watch workmanship and finish, and the vehicle is accepted, firstly, on the results of a series of engine bench tests, and, secondly, on road or cross-country performance. Weakness in material is safeguarded by the insertion of a guarantee clause in the contract, under the terms of which, the maker must replace any faulty part, free of charge, within two years of delivery.

Calipers, micrometers, gauges, Brinell and other testing machines, sclereoscope, stroboscopes, etc., are all instruments which help the inspector to play his part and these have been in existence for many years. Recently, however, a further aid in the relentless search for error and weakness has been found in the application of the X or Rontgen-ray. The use of radiology, as it is called, is gradually being extended and will no doubt continue to expand with the advent of more highly developed apparatus. The possibility of detecting flaws or pipes in steel shafts, while in the rough stage, before time and money has been wasted on

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machining operations, has much to recommend it. It is also of great use in determining photographically whether complicated articles, such as fuzes, have been assembled correctly, and in guaranteeing that important parts such as shearing wires have not been omitted. Even where it cannot be employed on routine work radiological examination becomes invaluable in cases in which special examination may have to be carried out.

Summing up it will be seen that work undertaken by any inspecting authority does not merely consist in the intelligent use of a ruler and a pair of scales, whereby a store is accepted or rejected according to a fixed standard. Inspection is a far more complicated procedure than that, and presents problems which call for skilled knowledge and organizing ability to solve. It may perhaps be aptly termed "the salt", and if the salt should suffer or lose its savour, the results would be disastrous financially and might, under certain circumstances, be fatal to human life.

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THE STRANGE ADVENTURE OF MAJOR R. V. WINKLE.

THE oldest major was riding home from the Range wrapt in the most impenetrable gloom. And not without good reason; for his battery had just been guilty of a display which could only be characterized as indifferent, even by the most sympathetic. They had made a bad beginning when one gun had gone out of action—through recuperator trouble which had been thought to be avoidable—and after shooting badly all the morning had reached the culminating point in the final series, a brigade concentration, when, after keeping everyone waiting for half an hour or so, their remaining three guns had deposited their missiles in a splendid isolation, which showed up only too clearly their lack of parallelism, quite a thousand yards away from the spot on which it had been intended that they should fall. At the subsequent post-mortem, if he had not been actually told off, it had at least been delicately hinted that his battery had not attained to that degree of efficiency which was both desirable and to be expected.

He supposed that it was really his own fault: but when one is doing one's eleventh consecutive practice camp as a battery commander, and can see no apparent prospect of ever doing anything else, one must be forgiven if one has allowed the enthusiasms of youth to fade a little. After all, his turn-out was beyond reproach, he had always been particular about that, so was the condition of his horses. As for his officers; well they all hunted, one played cricket regularly for the regiment and another occasionally, and it wasn't every battery commander who could say that. Perhaps he ought to have chased them a bit harder, but why shouldn't the young fellows enjoy themselves? Life was short and he was certain that they would be all right if ever there were another war.

His failure on the Range was not the oldest major's only trouble. He had that morning received an intimation that he might hold himself in readiness to embark for India on the first trooper. He had expected it, but that did not make the prospect any the more attractive. For one thing it meant that he would

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have to keep up two homes, and he doubted whether his finances would run to it. The question was—Would he not do better to chuck the army now before it chucked him?

Immersed in these dismal reflections, he was perhaps not paying sufficient attention to where he was going, or as to how he was going to get there, so that when his horse put his foot in a hole and pecked badly he made a somewhat undignified descent upon his head. Fortunately he was not hurt, only a bit shaken, but his horse went home at once with his horse holder in hot pursuit, and he was forced to complete his journey on foot. It was the last straw and a fitting termination to a thoroughly unsatisfactory morning.

However he reached the mess at last, and after a large glass of beer and a wash, followed by lunch with more beer and a glass of port—or was it two glasses?—he felt a bit better. He decided that he would not go to his office just yet, so seeking a row of easy chairs which had been placed in the open on the shady side of the building he selected one and composed himself for a period of quiet meditation.

It was a perfect afternoon. Hardly a cloud was to be seen against the deep blue background of the sky; a gentle breeze just stirred the red flag hanging limply against its pole, while a distant and intermittent boom suggested that out on the range a shoot with aeroplane observation was in progress. Nearer at hand the only sounds which broke the stillness were the singing of larks overhead and the subdued falsetto crooning of a mess waiter as he went about his business of polishing the spoons. The oldest major was away back in the past recapturing some of those youthful enthusiasms which he had so unhappily allowed to slip away from him.

"What fun those old practice camps had been in India in the old days. What keenness had been displayed, sometimes almost to the verge of dishonesty. How they had sneaked out overnight trying to find out where the targets were, and how they had covered up their mistakes on the day itself. They had been capable of almost anything which might help them to obtain the coveted 'crossed guns.' And the 'gin crawling' in the evening, so companionable, all gone now; things were much too serious.

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"After all, what did it matter if they did conceal their mistakes? At least it showed that they knew enough to do so. Well he remembered one that he hadn't been able to hide, when entrusted with a calculation on the new field plotter, he had produced a result from which the series had never recovered. Well he remembered also what his major had said to him. His first real telling off. And he had been getting them regularly ever since. He had got one that very morning. Yes, by Gad he had, and he was getting a bit old for that sort of thing now."

The waiter stopped humming and began to whistle through his teeth one of the masterpieces recently laid at the feet of that long-suffering lady, Terpsichore. "Drat the fellow," said the oldest major, "can't I get any peace anywhere?"

He got up and cursed the offender into silence, and was about to resume his seat when his eye was caught by a couple of pamphlets, apparently left by Fate, lying on the next chair. Now I have every sympathy with the oldest major; he had had an extremely difficult morning and his head ached considerably. But I do not think he should have behaved as he did. He went completely off the deep end. Happily there was no one within hearing to tempt him to voice his opinions aloud. Possibly he had been unwise in his choice of refreshment on so warm a day and after the bump he had received on his head. Anyhow, I am afraid that it must be confessed that he allowed his thoughts to wander into distinctly rebellious if not actively Bolshevistic channels. It were better to say no more about them, and I am only urged to record something of what passed through his mind in the hope that it may afford some clue to the unusual experiences he went through later in the day.

It hardly matters what were the titles of the two pamphlets. Suffice it to say that one dealt with matters of equipment, and the other with the progress of training. They are admirable productions in their way, but they offended the oldest major.

"What the —— is the use," he thought, "of educating men to use their brains and then inventing a filthy lot of gadgets which deprive them of all opportunity of doing so? And as for the young Napoleons who wrote this other thing! Good Heavens," he thought, "I've made and forgotten all those mistakes myself a hundred times, and they think they have found out something new."

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This, perhaps, was hardly to his credit, nor, since he was apparently still making them, strictly logical; but as I have tried to show, he was scarcely at his best.

"Why can't they treat us as human beings," he went on, "and give us something to work for? Now that there is no chance of a war we want some incentive to do well."

What had he got to hope for, he'd like to know. And now he supposed he would go back to barracks and help to run brigade sports. He hated brigade sports. Then he would have to go out on manœuvres, sit about all day, sleep in a ditch, get wet and come home just in time to embark for India. He hated soldiering, he hated the very sight of a soldier, he hated everything, he was fed up.

But there, I think that is enough. No doubt others have felt as he did under similar circumstances, and I do not think we should blame him too severely. After a little he began to calm down. No-one could remain worked up for long on such a lovely day, and gradually his thoughts drifted into pleasanter channels.

He was busy reorganizing the army on lines of his own. It was a beautiful army, a combination of the regular and territorial forces, with everything arranged on strictly business and competitive lines, and with plenty of high commands available for all who had the desire and ability to obtain them. Even he could be a major-general in an army like that. Presently he began to experience the reaction consequent on all he had been through. He felt a bit drowsy. His head nodded and at last fell forward on his chest. The waiter completed his task among the silver and went off to his tent; and silence descended over the landscape. The oldest major slept.

When he awakened he was surprised to find the sun shining full on his face, although he distinctly remembered choosing his chair with the object of avoiding that very contingency.

"Good heavens," he thought, "I can't have been here all night."

Then gradually he became aware that there were other unusual occurrences taking place in his neighbourhood. He rubbed his eyes and looked about him. From the direction of the range came a dull roar, like a sound of distant cheering—and surely, "that was not a band that he heard"?

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Yes it was though; and getting up he was astonished to see that the ridge to the south of the mess and stretching up away to the west was black with people. I use "black" in a figurative sense, for there appeared to be quite as many women as men crowded there, and their gaily-coloured dresses and parasols made a delightful picture against the green and purple of their background.

On the low ground beyond the mess, where he had been accustomed to see a row of gunparks, stood serried rows of parked charabancs, while every now and then a fresh one would arrive and disgorge its load to stream up the hill and join the multitude already assembled on the top. Between the mess and the ridge had been erected several large marquees gay with bunting and flags of various patterns; regimental or club colours, or something of the sort.

"Must be having camp sports or a point-to-point," thought the oldest major, "curious that I should have heard nothing about it."

He got up and going to his tent for his field glasses, started off up the hill in order to see what was going on. The first thing, amid the medley of sounds, that caught his attention were the raucous cries of a line of bookmakers who had erected their stands on the ridge to the left of the last marquee, and who were apparently conducting a brisk trade.

"A point-to-point, it is," he thought, and was soon aware of a gigantic notice board on which were posted the names, not as he expected, of horses, but apparently of batteries, thus:—

1. 1st/45th Field Battery, K. & S. Artillery.
2. 3rd/53rd ,, ,, H. & D. ,,

etc., etc., the whole surmounted by the legend:—

2ND EVENT.

BATTERY COMMANDERS' SHOOTS.

Reaching the top of the ridge he found himself looking out over a wide valley which he did not remember ever having seen before. It was generally open, though broken up here and there by patches of wooded country and was perhaps three or four miles across to the top of the further ridge. Immediately below him was

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a long line of field batteries in action; there were seven or eight of them and they were all quite close together following the line of the reverse slope of an underfeature of the crest on which he stood. All the guns were pointing out straight across the valley. So far he had taken no notice of the people about him. Most of them were civilians, but there were a few soldiers in uniform among them, and a number of officers were gathered together in an enclosure some distance in front of one of the largest of the marquees. He began to look about for someone he knew, but at first without success. But if he himself felt a stranger there were apparently people who recognized him, because, presently a fattish red-faced man catching his eye smiled delightedly and shouted "There's Winks, good ole Winks." (The oldest Major's name was Winkle. Perhaps I should have told you this before.) The crowd soon took up the cry. "Good ole Winky boy," they yelled, " 'E's the one." The bookmakers echoed the call in another key. "Six to four Winks," they shouted. "I'll give six to four the Kent & Sussex. Five to one—bar the Kent & Sussex."

Here and there among the crowd had been erected high wooden pedestals with loud speakers on the top of them, and suddenly they began to emit some announcement in strident tones :—

> "1st Event. Predicted shooting. Result. Winners, 2nd Battery, 59th Brigade, Western Counties Regiment, R.A. Time, 18 minutes 49 2-5 seconds. Accuracy 95%."

This was received by the crowd in almost complete silence, but the state of jubilation apparent among the bookmakers seemed to indicate that an outsider had triumphed. The oldest major felt utterly bewildered. He wandered off towards the officers' enclosure, and catching sight of one who wore the red capband of a gunnery instructor, approached him with a view to asking what it was all about. Suddenly, however, he was overcome by a feeling of shyness, and a disinclination to give away the fact that he felt such a lost sheep, so instead of putting the question he had intended, all he did was to ask whether he might go down to the battery position.

"Certainly Sir," was the answer. "Your lot are on the extreme right, about the best place too. I'm afraid you won't have time to get out to the O.P's now though, they are half way across the valley."

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The oldest major thanked him and was just moving away when the gunnery instructor called out "Oh Colonel you won't speak to them, will you. It would be a pity if the favourites were disqualified."

"Of course I won't," he answered, and continued on his way more bewildered than ever. Why did they call him "Colonel"?

He took a side-long glance at his shoulder straps, and found that they were decorated with the crown and star of a Lt.-Colonel, the whole surmounting the mystic letters "K. & S." But by this time he was beyond being surprised. Realizing that something was going on that he could not understand he came to the conclusion that he had better keep his eyes and ears open, and his mouth shut, and pick up what he could. He reached the right-hand battery position.

There were four guns there, 18 prs., or something very like them, and the detachments knelt round their weapons as motionless as graven images. There appeared to be no section commanders, but a G.P.O. on one flank stood behind a vehicle on which was mounted another loud speaker. At first he failed to recognize anyone among the detachments, and began to think he had come to the wrong battery. Most of the men were quite young, but all were well set up and obviously in perfect condition. There were a few older ones, however, and—"Ah, there was one he knew. The No. 1 at No. 3 gun. But what was he doing with a sergeant's stripes? He ought to be a lance bombardier. He seemed to have aged, too. There was another—Gr. Trumble, doing No. 4 at No. 1 gun, a real good old soldier of the old-fashioned canteen type."

At that moment there was the sound of a distant gun, and suddenly orders began to come down through the loud speaker. "Battery take post—Target trench—H.E. 106" etc., etc., all the old familiar patter which he knew so well and which he so inevitably gave out wrong himself. Very soon the guns began to fire and he had the opportunity of admiring the best drill he had ever seen. As near mechanical perfection as anything human could be. No orders were repeated and none were acknowledged, if ever there was any doubt about one, and that was very seldom, the No. 1 concerned simply held up his hand and the G.P.O. put him right.

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You can always tell, in a battery position, when things are going well at the O.P., and in this case they obviously were. Orders came through promptly and crisply, guns were loaded, laid and fired with precision, and the whole thing went like clockwork. He had a look at the battery next on the left. Things were not quite so happy there. Not that any complaint could be made of the drill, but orders were coming through slowly and with apparent hesitation, and there did not seem to be quite the same life as there was in the first one he had watched. Walking up onto the crest which concealed the guns from the front he found that he could see the line of bursting shell along a trench system away up on the far side of the valley. Getting out his glasses he was interested to see that they had gone back to the old custom of putting up dummies in the target, the heads and shoulders of several were clearly visible. He also got some hint as to what was wrong with the battery on his left. Waiting until a gun fired he watched for the shell on what he imagined was the correct portion of the target and was diverted to see two burst there, close together. "Mixed up with someone else," he thought, "just what one would expect, I wonder what they learn from this sort of thing."

In a few minutes the right-hand battery completed its shoot, and the order "Empty guns—stand easy" came through. Another further along the line did the same a few moments later, but the remainder continued to shoot until a trumpet sounded the "Cease fire" from the hill behind when they all followed suit. In due course the result was announced by the loud speakers :—

> "Winners, 1st Battery, 45th Brigade, Kent & Sussex Regiment, R.A. Time, 4 minutes 52 seconds. Percentage of target destroyed 77."

This was apparently more to the taste of the crowd who voiced their appreciation in no uncertain manner, while a corresponding air of dejection among the bookmakers testified to the success of a popular favourite.

The next event was a tank shoot. Only one subsection of each battery took part and they fired in turn, having presumably drawn lots for order of precedence. Each had to deal with four targets, and these advancing at various angles and speeds towards their

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antagonists looked very much like the ones to which he was accustomed except that they were made of some kind of inflated bladders which burst and disappeared on being hit. The competitors had varying degrees of success with this target. Sometimes one or even two of the tanks would come through unscathed and get right into the battery position, but more often they were all hit, though in one case it was touch and go, the last attacker being practically blown from the muzzle of the gun.

When it came to the turn of the Kent & Sussex battery, the oldest major felt quite excited. He saw a wonderfully efficient performance. The first tank was hit by the second round almost as soon as it appeared, and the whole four were lying in ruins in under forty seconds, only nine rounds having been fired altogether. There was no doubt about who had won this contest, and the subsequent roar of approbation on the hill top confirmed another popular victory.

I do not think it necessary to give a full account of the remainder of the day's proceedings. There were six events altogether, each representing some recognized gunnery problem, and the Kent and Sussex battery were successful on three occasions. The oldest major did not stay to the end. He felt tired and hungry, so he went off to his tent where he had some difficulty in meeting his batman's jubilant excitement with a suitable display of enthusiasm.

He was very quiet in mess that night. To start with he knew hardly anyone there, and he wanted to think. He told the man next him that he felt a bit out of sorts, which was no more than the truth, for he had been overwhelmed with congratulations and aperitifs in the ante-room and scarcely knew whether he was standing on his head or on his heels. There was nothing unusual to note about the dinner itself; about practice camp dinners there seldom is, and in that at least he was thankful to find something that had remained unchanged. It came to an end at last, the King's health was drunk, for it was guest night, and the oldest major was allowing himself to contemplate the night's rest, of which he felt he stood badly in need, when up got the C.R.A., rapped the table sharply and prepared to make a speech.

"Gentlemen," he said, "I rise to propose the health of our

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good friends and partners, the 7th Field Brigade, Kent & Sussex Regiment, Royal Artillery" (loud cheers), "coupled with the name of Lt.-Colonel R. V. Winkle" (loud and prolonged cheers). Here he bowed and smiled in the direction of the oldest major. "There are two reasons why I am sure you will wish to join with me in doing them honour, one joyful, the other sad. On the one hand they have to-day, through the agency of their second battery—Major Postlethwaite" (cheers)—here he bowed towards an officer on the other side of the table—"enabled our 45th composite brigade, represented by its 1st battery—Major Somerscales" (cheers and a further bow and smile), "to win a most coveted distinction. I refer of course to the gunnery championship of the Southern Army" (prolonged cheers). "They have to-day, by obtaining three firsts, one second and one third, out of six events, done better I believe, than anyone previously has done since these contests were started." (Cheers.) "On the other hand, and here I come to the sad side, we are about to bid them good-bye." (Sympathetic noises.) "As you know they sail for India in a few weeks' time and will in due course be replaced by their opposite numbers, the 8th Brigade from Rawalpindi, to whom I am sure we shall extend our heartiest welcome when they arrive" (hear hear). "Now I think that the present occasion, with its mixture of joy and sorrow, may be regarded, as it were, as a milestone; marking as it does the end of the first and what may be regarded as the most experimental stage of our new organization, which as you know came into being some five or six years ago: and I think that a few words in retrospect of those five years may not be out of place to-day" (hear hear).

"I am sure you will all agree with me when I give as my opinion, my considered opinion, that the experiment has been an unqualified success" (hear hear), "not only as regards our own regiment, but as regards the army as a whole" (cheers). "Not only have we now got 16 well-trained divisions, with their necessary complement of army troops, ready and willing to take the field at any moment, and that at a cost certainly no greater than that of the old army which could have fielded less than a quarter of our present strength in the same time; but we have succeeded in interesting the whole nation in army affairs, and we have now

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got a public backing, only apparent in the past on occasions of great national emergency. When I add that there has been at the same time a noticeable improvement in national health and physique, you will agree that not even the most captious critic can find just cause for complaint.

"At first, you will remember, we regarded, or some of us did, this experiment with misgivings. The gain was by no means certain, and there seemed to be a lot to lose. I am not sure who stood to lose the most. Possibly it was the Territorial Army, whose units were required to sink their identity altogether, and to wrap themselves about their regular nuclei, as, may I say, the bread encloses the meat in a sandwich" (laughter). "But no sandwich is any good without bread, and I am sure that ours here is a most excellent brew—or cut—or whatever it is you do to sandwiches" (hear hear and cheers). "Nor were the regulars themselves entirely free from doubt. True that they retained their organization at any rate for part of the year, though during combined training, manœuvres, etc., and of course on mobilization, they also stood to lose it. There were many who did not, if I may mention such a subject here without giving offence, like the idea of finding themselves under the command of those whom they may have considered to be amateurs at the game of soldiering. But let those of you who are old enough to remember it, cast your eyes back to the Great War of 1914-18. What happened then?

"Let me give you my own experience. I finished the war as a captain in an unimportant side-show, while my second cousin, a civilian and a person whom I despised, finished as a colonel! Calls himself 'Colonel' still too, yes by Jove he does" (laughter). "At any rate we shall have none of that in the future. We know where we are now. We know each other and we trust each other" (hear hear). "And to whom should we be grateful for this highly satisfactory state of affairs? If I may mention names, it is to Majors Postlethwaite and Somerscales" (cheers), "to Lt.-Col. Winkle" (loud cheers) "and to thousands like them, from the highest to the lowest, who by their untiring energy, their sympathetic attention to detail, and their loyal co-operation with their superiors and with each other have done so much to make this experiment the success it is." (Loud and prolonged cheers).

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"Now I will not keep you much longer, but I feel I cannot sit down without making some reference to competitive training in general, and to the type of contest in particular we have been taking part in to-day. There have always been two schools of thought on the subject of competition in training. The Navy, as you know, have always recognized its value, but with the Army it was rather different. It was held to have a prejudicial effect on instruction and to lead to sharp practice, chicanery, dishonesty even. But that feeling has gradually died out. With no prospect of an early war it was found necessary to provide the human craving for excitement with a substitute. Hence these meetings, and who can say they do harm? Not I, for one. Our shooting has improved, our drill has improved, and what is more, as I have said already, we have succeeded in interesting the public. After all, you all know the difference between a cup tie and a friendly, and what first-class player of any game has ever achieved his skill by invariably playing with nothing at stake. It is not so much the young fellows who need this stimulant, for although they are often grossly careless, they are generally keen enough. It is the old and crusted, at present represented by the last of the pre-war vintages whom we wish to make 'feel the needle' " (laughter). "Personally I am firmly convinced that whenever the time comes that a man can embark upon an enterprise without feeling any anxiety or nervousness, he had better chuck it and become a spectator. If he is not anxious he will not have to brace himself up, and he will not produce the best results.

"Now although we become brigade and battery commanders a good deal younger than we used to under the old system, there are still plenty of men to-day, who are, if not too old for their jobs, at least old enough for better ones" (laughter). "That must always be so in peace time, and since it is the mental condition of the commander which really decides the tone of his unit, we are simply trying to preserve the spice of life a little longer for those who are in danger of becoming too sophisticated. As to whether we have been successful. Well, I can only say that I am thankful that I never had to shoot a battery in front of a crowd, and a critical crowd at that, running well into six figures."

The oldest major had been listening with rapt attention. At

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last he was getting some insight into matters that had been puzzling him. Although he had still no idea how so much could have happened in so short a time, he was beginning to get his bearings in the surroundings in which he found himself. Suddenly, however, it dawned upon him that he might shortly be required to reply to the eulogy with which the speech had started. Can we blame him if his heart quailed before the prospect of so horrid a possibility, and he resolved to get away while he could. Muttering something to his neighbour about feeling unwell and apologizing to the president, he slipped quietly from his seat and hurriedly left the room.

Arrived at his tent he sat down on the edge of his bed, held his head between his hands and began to think furiously. At once he realized the improbability of his being allowed to remain long where he was. It was imperative that he should make some attempt to sort things out before he was dragged back to the mess. He resolved to send for his adjutant. As it happened, he was saved the trouble, for with a cough and a "May I come in, Sir," the officer who presumably held that appointment parted the fly and entered the tent.

"I just came round to see whether anything was the matter" said the newcomer, "I hope you are not ill, Sir, I thought you were looking a bit queer all through dinner."

"Sit down," said the oldest major, "perhaps you can help me; I don't know what is the matter. I am either off my head, or suffering from loss of memory, or maybe I'm dead and have been born again in the next world. All I know is that I began the morning as a major commanding the 310th Field Battery, and now I am a Lt.-Colonel commanding the Lord knows what. I have to-day assisted at the most extraordinary function, half practice camp, half race meeting, that I have ever seen, and the C.R.A's speech just now has just about put the lid on it all. No," he added, seeing perhaps a questioning expression cross his subordinate's face, "I am not drunk, I only wish I were. I'd understand it then."

Now the adjutant was a young man of some sympathy and discernment. He had heard of such cases, of course, though he had never met one, and he believed that the best course to take was to humour the victim. "Well Sir," he began, "it sounds very

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strange, but I will do what I can to help you. What date do you think it is to-day?"

"August 8th, 1930," answered the oldest major promptly.

"Good Lord, Sir," said the adjutant, "you *are* a bit behind the times, this is 1942."

"1942! Then I must be sixty years old, I don't feel it, and why am I only a Lt.-Colonel? I ought to be a major-general at least, or else retired. But it doesn't matter, please go on."

"I'll do my best to put you straight, Sir," went on the adjutant, "but it is a bit difficult; I only joined in 1929 and may not remember very well. 1930. Let me see, that would be about the beginning of the period of the intensive campaign for reduction of armaments. All those Peace Pacts were in full swing. I have no doubt that there were men who honestly believed that the best way to prevent war was to have nothing to fight with, and they were certainly in the ascendency at that time. There was even a suggestion to abolish the Home army altogether. No-one had quite gone the length of trying to disband our foreign garrisons, but the idea was to have a foreign service army only with nothing but depots at home. I believe it might have happened too, if—— but I'll come to that in a moment. Anyhow, there is no doubt that the army did in fact become smaller and smaller, until it reached a stage when it could have been no use to anyone. To have sent it abroad as an expeditionary force would have meant nothing less than the useless massacre of such few trained soldiers as we still possessed. Of course, this trend of events did not appeal to everyone. There were still some who had little faith in the millenium, and the War Office did not like it at all. Still, the situation had to be faced.

"Then someone had a brain-wave, in fact two waves. I think he got the first from the extraordinary success of such military spectacles as the Aldershot Tattoo. Tattoos were increasing and multiplying beyond all bounds, they were almost a nuisance and were beginning to interfere with ordinary training, but they never failed to draw the public in thousands. Very well then, if we could not have an army, there was no reason why we should give up military training for anyone who cared to undertake it. From military spectacles it would be but a short step to military com-

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petitions, tourneys, skill at arms contests, call them what you will, to which the public should be admitted. There should be no difficulty in providing equipment unless we were ordered to destroy all we had. Such a scheme would certainly not produce an organized army but it would produce the material from which to build one, and that was half the battle.

The second was rather different. So far no-one had made any attempt on the life of the Territorial Army. After all, they were really civilians who had their own jobs, and in spite of their record in the Great War, were not held to be so visible a sign of a militaristic policy as was the regular army. But why should they not be stiffened with regulars. Call them permanent staff instructors, or anything you please. There would be plenty available if the regular army were to be disbanded. Well, both these ideas caught on among the powers that be, plans were worked out in meticulous detail and duly pigeon-holed in case they should one day be wanted. Then, as has so often happened in our history, we were saved from our internal enemies, or perhaps I had better call them busybodies, by the precipitate action of our external ones. There came the great war scare of 1935. Russia was at the bottom of it, as you may imagine, but there was more to it than that. Things were not going at all well with——but no matter, it is all over now and past history and there is no point in harping on what might have happened. It will be enough if you understand that the outlook was extremely black and that the wind was blowing vertically up the great British Public.

"The result was remarkable. I wish you could have seen the great 'Hands off the Army' demonstration in Trafalgar Square. It warmed one's heart. The movement spread all through the country, there were even riots in some districts and several of the more ardent Bolshies and pacifists got pretty roughly handled. Everything was plain sailing then for the War Office, and I must say that they handled the situation with a good deal of foresight and acumen. They had seen this sort of thing before and they knew that the present state of feeling in the country would not last (as a matter of fact the war scare died out pretty quickly and came to nothing); and they resolved to strike while the iron was hot, and to see to it that so dangerous a situation could never arise again.

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"They had their plans, which I have already described, and with some modifications they started to put them into execution right away. The result has been—well, you have seen part of it to-day."

"Yes, that gives me some idea," said the oldest major, "but I am still not clear on a good deal. Do I understand you to say that we have now a sort of composite regular and territorial army?"

"Yes, that's right," answered the adjutant, "we have two organizations really, the 'Regular' and the 'Composite.' The former provides all the garrisons for abroad and also the nucleus of the composite army at home. The home part of it is, for the greater part of the year, organized much as it always was. It lives in the same old barracks and does its ordinary individual and elementary training, which (as far as we are concerned) includes a short practice camp, as a regular army; but for mobilization every man is earmarked for a definite place in the composite force, nominal rolls are kept showing exactly what each man has to do, and this organization is actually put into being every year for the second part of training.

"The Territorial Army has no real organization as such at all, and does no independent training beyond its ordinary winter drills and week-end camps, and it gets all its instruction from its affiliated regular units."

"You mean to say that a composite battery is actually composed of a mixture. It might have a territorial major, regular captain, territorial B.S.M., and so on?"

"Yes, that's the idea. It works all right; we all know each other, and it makes for a more level lot of units, than if we had, say, one regular and three territorial batteries in each brigade. Of course there are dozens of different ways of doing it, but I've got a form in the office which shows how our own particular divisional artillery is organized,[1] I'll send it round."

"Thanks very much, I'd like to see it. But what happens when a regular battery has to change its station or go abroad. It seems to me that your affiliation scheme must break down, and you will have to begin afresh, getting to know each other and so on every time that happens?"

[1] See Appendix A.

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"Oh no. You see the affiliation is absolutely permanent. But perhaps I had better explain that we are no longer just the Royal Regiment of Artillery. We still have a central headquarters on the Plain, but we are divided up into sixteen separate and more or less independent regiments. We had to do that in order to come into line with the rest of the army. You see the country is divided up into sixteen territorial or geographical areas, and each has to find a complete division for the expeditionary force, a proportion of corps and army troops, and a fair share of foreign garrisons and purely home defence units such as anti-aircraft and coast defence artillery. It works out that we have to find two regular units to each three or four territorial ones, depending upon the requirements in each case; for instance there are two regular field brigades to three territorial, but two regular to four territorial battalions in the infantry. One of the regular units is always abroad, and the other forms the nucleus of the composite unit concerned. They relieve each other every six years and the unit at home stays in the same station the whole time, so there is nothing to upset the affiliation. Moreover, the organization being on a strictly 'county' or 'area' basis there is tremendous 'esprit de corps' and the whole thing goes like a house on fire."

"I suppose that accounts for these letters 'K. & S.' on my shoulder," said the oldest major, "but tell me, you surely cannot balance home and foreign units so exactly as you seem to describe."

"Well, we had to make some adjustments, of course, but as far as our regiment is concerned you would be surprised to find how little was required, and I believe it was even easier for infantry and other arms. It was only field batteries that gave us any difficulty and even now there are twice as many at home as abroad, but the foreign service ones are double size, and they also have to find the personnel for the ammunition columns. We don't keep up any columns at home in peace time, they would be formed on mobilization. If you look at the 'Blue List' you will see pretty well how it is done." [1]

"Does the 'Blue List' show also what each of your sixteen regiments consists of?"

"Yes, there is a summary,[2] but I can tell you that in a moment.

[1] See Appendix B.
[2] See Appendix C.

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We find the personnel for 1 horse battery, 7 field, 2 light, 2 medium and 4 or 6 heavy, coast defence or A.A. batteries. Total 16 or 18 batteries or about 100 officers, including a few extra for secondings to staff jobs, Indian mountain batteries, etc., and about 2500 other ranks. Of the seven field batteries, two are abroad, being brigaded with two from some other area, and finding a D.A.C. between them, and the other five are at home, forming the nuclei of the three field brigades of a composite divisional artillery and of one army field brigade—and so on—except for horse artillery where we have only one battery each, and have to work in with another area for relief."

"I'm surprised to hear that you still have horse artillery, I should have thought that would have disappeared long ago."

"Well, as a matter of fact it has, at home, in that all the batteries are mechanized, but they still use horses in India and Egypt, so we have to allow a few at home, and keep up riding establishments, because of course the men have got to learn to ride. In all types of battery we are still allowed one forage per officer, and seven for N.C.O's and men. We have to find our own horses, but we generally try to keep up the full number allowed."

"Yes, I see. But to go back for a moment to the subject of all those separate regiments; have you not aggravated the vexed question of promotion, and what about accommodation, surely it is impossible to keep the whole of these regiments centralized and intact?"

"We don't try to, why should we? To start with they comprise batteries of all natures, and there is no more objection to brigading batteries of different regiments than there was in brigading battalions in the old army. As for promotion, we are all on one list from major upwards, and such questions as acceleration or retardation are very much simplified."

"That is quite true. But tell me, has every officer to be prepared to serve in all these different sorts of batteries?"

"Oh yes, Sir—and so have the men, though perhaps not quite to the same extent. You see we have changed the terms of service for them. Other ranks now join for 12 years with the colours, which gives them 6 years at home and 6 abroad. They always join

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and finish at home, so drafts are practically a thing of the past except to replace casualties, and that alone saves a good deal of money. Then practically every man who is any good can re-engage for a further 12 years, and a few go on even longer. When they leave they get a pension according to rank and length of service and join the 'Other Ranks Reserve', similar to the Reserve of Officers, and are available for training and stiffening new units if expansion beyond our sixteen divisions ever becomes necessary. So you see the army offers a career to everyone now, and as there is in consequence far less fear of unemployment for the 'time ex' we get absolutely first-class men."

"Yes," murmured the oldest major, "that would account for Gr. Trumble—oh, only an old soldier I saw to-day, he must have well over 30 years' service. Is the Reserve of Other Ranks the only reserve we have now?"

"The only regular reserve. We don't need any more. The territorial reserve (they serve for 4 and 8) fill up any gaps there on mobilization."

"I'm beginning to get the hang of the organization now, I think; but I still can't account for that extraordinary display on the range to-day."

"Oh that. Well first of all you have got to grasp the fact that the army has now an extraordinary grip on the public imagination. You might say that each division is the focus of the life of the area from which it is drawn. In fact there was trouble at first because some counties could not have divisions of their own, but had to be lumped in with others. But inside the divisions smaller units are more or less localized, being made up as far as possible of men from the same districts, and they usually give themselves local names though these are not recognized in official publications. For instance, that battery of yours that did so well to-day calls itself the Canterbury battery. So you see practically every town and district has some battery or company it can consider peculiarly its own. It is a little hard to understand the intense local patriotism, if you have not seen it growing up. It is the competition that has done it. The whole thing has become a game and we are as important as the county cricket eleven, or the local league football team. The result is of great benefit to us. We get free institutes,

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free recreation grounds, free horses, all manner of things. They even give us money sometimes. And in return we provide the thrills.

"You see all training is arranged on a competitive basis nowadays, at least all composite training is. We have gunnery competitions, tactical competitions, both alone as gunners and in conjunction with other arms, and even manœuvres take the form of organized matches between the two sides. Then of course there are preliminary contests inside brigades, and what you might call 'friendlies', partly in order to select representatives for the bigger ones, and partly because we like them. We have found them of great value, especially in times of perfect peace, they provide an incentive right through from the start, and though of course they are no substitute for war, they do, as the C.R.A. said, provide an atmosphere of their own. And success in one of the big contests carries a reward other than the mere prize and glory attached; for instance *you* may quite well be promoted as the result of to-day's effort. And as you have seen, the public are most keen. I daresay there were 100,000 people there to-day, and they all paid to come in, so we actually made money over it. In fact we generally do, and training costs us practically nothing. We haven't quite arrived at feeding and paying the personnel yet, but I think I may say that our 16 divisions to-day cost the taxpayer less than our 4 regular and 14 territorial ones did in the days you remember."

"I suppose that with all this keenness, composite training is not limited to the old fortnight a year of the territorials?"

"Theoretically it is, but actually employers will always let men off, for important events. You see the various divisions do different things each year. One may be on fairly elementary work, and another on divisional manœuvres. They take turns at it, and the cycle takes about three years; but an awful lot of really elementary stuff is done in the men's spare time."

"Quite a Utopian army in fact—but one more question. Is there any real practical value in such a show as I have seen to-day? It didn't seem to me that there was much to be learned from it. No tactical scheme, all the batteries firing at once, under no sort of supervision. How do they spot mistakes in drill, for instance?; all jumbled up together, too, and observing each other's shell as likely as not?"

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"Well—you see. That was a purely gunnery competition designed to test proficiency in the gunners' first duty of hitting the target, hard, often and quickly. As for the drill, have you ever seen better anywhere? We simply don't make mistakes. If we do they bring their own reward since we lose time and that means we are out of it straight away. As for observing each other's shell, surely that is quite a fair condition, such as is very liable to obtain in war?"

"Yes, no doubt you are right. It is all very interesting. But what about all these people. Is just anyone allowed in? What's to prevent a lot of foreigners being there, spying out our secrets?"

"Nothing. But after all, there isn't much secret about it. People were always able to watch manœuvres and even I can remember crowds of villagers watching 18 prs. firing blank in the corner of a field. The people to-day are extraordinarily well instructed in military matters, they know what they are watching, and that is all to the good, both in the interests of peace and from the point of view of having material ready to hand if ever we should need a bigger army. Of course we do have our secrets; we still have our experimental establishments, schools, etc., which are entirely in the hands of regulars and to which the public are not admitted. They are very much the same as they always were, except that the schools devote most of their courses to Territorials who need them most. Regulars don't do courses in their own weapons unless they are fresh back from the staff or are training to be instructors themselves."

"Well—thank you very much. I suppose it all works all right, as you say so, it certainly seemed to be a live show to-day, quite exciting at times and far more interesting than sitting for a couple of hours at an O.P. and then watching perhaps a dozen rounds fall on the ground near no apparent target, which is what I did this morning—or was it yesterday?—it seems a long time ago now."

"There is no question that it works, as you will see for yourself when you get more used to it. But now, I think, if you feel equal to it we had better go back to the mess. I know they want you to. Listen! they are coming for you now."

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The oldest major listened. Yes, they did seem to want him. A sound, faint at first, and growing momentarily louder broke upon his gratified ears. "We want Colonel Winkle. We want Colonel Winkle. We want Colonel Winkle, and we mean to have him. We want Colonel Winkle—Winkle—Win—kle—W—i—n—k—l—e—. Win—kle. Sir. Winkle, Sir. Major Winkle, Sir!

He sat up suddenly and rubbed his eyes. An orderly stood before him. "Beg pardon, Sir, and the Colonel's compliments, Sir, and could you find it convenient to go down to his office, if you have the time, Sir."

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DISTRIBUTION OF REGULAR PERSONNEL TO COMPOSITE UNITS.

A.F. PQ.0000.

C.R.A.
Brigade Major.
Staff Captain and Staff Lieutenant—(Adjutant and Asst. Adjutant from Regular Field Bde.)
17 Clerks, orderlies, etc.—(from Brigade Staff of Regular Field Bde.)

	1st Field Bde.				2nd Field Bde.		3rd Field Bde.		Pack Brigade.			
Lieut.-Colonel	1*				1		1		1			
Adjutant	1*				1*		1*		1*			
Asst. Adjutant	1				1*		1		—			
R.S. Major	1				1		1*		1			
S.S. Artificer	1*				1		1		1			
Artillery Clerk	1*				1		1		—			
Clerks, orderlies, batmen, etc.	3* and 23				3* and 23		3* and 23		17			
	18pr. Bty.	18pr. Bty.	18pr. Bty.	4·5″ How. Bty.	4·5″ How. Bty.		4·5″ How. Bty.		3·7″ How. Bty.	3·7″ How. Bty.	3·7″ How. Bty.	
Major	1*	1	1	1*	1	Three 18 pr. batteries similar to those in 1st Field Bde.	1	Three 18 pr. batteries similar to those in 1st Field Bde.	1*	1	1	
Captain	1	1*	1	1	1*		1		1	1*	1	
G.P.O.	1	1	1*	1	1		1*		—	—	—	
B.S.M.	1	1	1*	1	1		1*		1	1	1*	
B.Q.M.S. ...	1*	1*	1*	1*	1*		1*		1*	1*	1*	
Farrier Sgt. ...	1	1*	1	1	1*		1		1	1*	1	
Farrier	1*	1	1	1*	1		1		1* and 1	2	1* and 1	
Saddlers	2	1* and 1	1* and 1	2	1* and 1		1* and 1		1* and 1	1* and 1	2	
Artificers ...	1* and 1	2	1* and 1	1* and 1	2		1* and 1		2	1* and 1	1* and 1	
Trumpeters ...	1* and 1	1* and 1	2	1* and 1	1* and 1		2		1* and 1	1* and 1	2	
B.C.A.	1	1*	1	1	1*		1		Orderly ...	1*	1	1
G.P.O. A. ...	1	1	1*	1	1		1*		Rangetaker ...	1	1*	1
N.C.O. i/c Sigrs.	1*	1	1	1*	1		1		Horse holder ...	1	1*	1
Signallers ...	2* and 6	4* and 4	2* and 6	2* and 6	4* and 4		2* and 6			4	2* and 2	2* and 2
Horse holders ...	1* and 5	3* and 3	2* and 4	1* and 5	3* and 3		2* and 4			—	—	—
Lewis Gunners ...	2* and 4	2* and 4	2* and 4	2* and 4	2* and 4		2* and 4		Hotchkiss Gnrs.	1* and 4	2* and 3	2* and 3
Storemen, Orderlies, Cooks, etc. ...	4* and 9	4* and 9	5* and 8	4* and 9	4* and 9		5* and 8			3* and 7	3* and 7	4* and 6
Clerk	1*	1	1	1*	1		1			1*	1	1
Drivers	5* and 10	5* and 10	5* and 10	5* and 10	5* and 10		5* and 10			6* and 12	6* and 12	6* and 12
Section Comdrs.	1* and 1	1* and 1	2	1* and 1	1* and 1		2			2	1* and 1	1* and 1
Nos. 1	1* and 3	1* and 3	2* and 2	1* and 3	1* and 3		2* and 2		G.P.O's ...	1* and 1	2	1* and 1
Bombardiers ...	3* and 7	3* and 7	4* and 6	3* and 7	3* and 7		4* and 6		Sec. Cdrs. Assts.	2	1* and 1	1* and 1
Farriers	2	1* and 1	1* and 1	2	1* and 1		1* and 1		G.P.O. A. ...	1* and 1	2	1* and 1
Gunners	10* and 18	9* and 19	9* and 19	11* and 21	10* and 22		11* and 21		Horse holders ...	1* and 3	1* and 3	2* and 2
Signallers ...	2* and 6	2* and 6	4* and 4	2* and 6	2* and 6		4* and 4		N.C.O. i/c Sigrs.	1* and 1	1* and 1	2
Drivers	13* and 27	13* and 27	14* and 26	15* and 21	15* and 21		16* and 20		Signallers ...	4* and 8	4* and 8	4* and 8
Batmen	1* and 3	1* and 3	2* and 2	1* and 3	1* and 3		2* and 2		Nos. 1	1* and 3	1* and 3	2* and 2
									Bombardiers ...	4* and 8	4* and 8	4* and 8
									Gunners ...	9* and 21	9* and 21	10* and 20
									Driver Sergts. ...	1* and 1	1* and 1	2
									Drivers	24* and 48	24* and 48	24* and 48
									Batmen	1* and 1	2	1* and 1

(Note.—An asterisk after the number denotes regular personnel.)

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EXTRACT FROM ROYAL ARTILLERY REGIMENTAL LIST (BLUE LIST) FOR MAY 1942.

Distribution of Regular and Composite Units—*Continued.*

COMPOSITE UNITS.			REGULAR (NUCLEUS) UNITS (AT HOME).		REGULAR UNITS (ABROAD).	
3RD (LONDON) REGIMENT.—(Continued).						
Heavy, A.A. & Coast Bdes.	1st (London) Hy. Bde. ... ... 1st Bty. (B.L. 6″ guns) ... ... 2nd ,, (B.L. 9·2″ How.) ... 3rd ,, (,, ,,) ... 4th ,, (,, ,,) ...	2nd (Southern) Army Artillery.	1st (London) Hy. Bty.	Shoeburyness.	3rd (London) Coast Bty.	Malta.
	3rd (London) A.A. D Bde. ... (Q.F. 4″)	Home Defence.	6th (London) A.A. Bty.	Chelsea.	5th (London) A.A. Bty.	Singapore.
	6th (London) Coast Bde.	Home Defence.	7th (London) Coast Bty.	Sheerness.	8th (London) Coast Bty.	Malta.
4TH (KENT AND SUSSEX) REGIMENT.						
R.H.A.	"D" Bde. ... ... 1st Bty. (Q.F. 3·3″ How.) ... 2nd ,, (,, ,,) ... 3rd ,, (,, ,,) ...	4th Cavy. Division.	"D" (Kent & Sussex) Bty. ... ... [Brigaded with "B" (London) Battery.]	Shorncliffe.	Nil. [Affiliated to "C" (London) Battery for relief.]	
Field Bdes.	45th (Kent & Sussex) Bde. ... 1st Bty. (Q.F. 18 pr.) ... ... 2nd ,, (,, ,,) ... ... 3rd ,, (,, ,,) ... ... 4th ,, (B.L. 4·1″ How.) ...				8th (Kent & Sussex) Bde. 1st Batty. 2nd Batty. [Brigaded with 6th (London) Bde.]	Rawalpindi.
	46th (Kent & Sussex) Bde. ... 1st Bty. (Q.F. 18 pr.) ... ... 2nd ,, (,, ,,) ... ... 3rd ,, (,, ,,) ... ... 4th ,, (B.L. 4·1″ How.) ...	4th (Kent & Sussex) Divl. Artillery.	7th (Kent & Sussex) Bde. ... 1st Bty. (Q.F. 18 pr.) ... ... 2nd ,, (,, ,,) ... ... 3rd ,, (,, ,,) ... ... 4th ,, (B.L. 4·1″ How.) ...	Brighton.		
	47th (Kent & Sussex) Bde. ... 1st Bty. (Q.F. 18 pr.) ... ... 2nd ,, (,, ,,) ... ... 3rd ,, (,, ,,) ... ... 4th ,, (B.L. 4·1″ How.) ...					
	48th (Kent & Sussex) Bde. ... 1st Bty. (B.L. 4·1″ How.) ... 2nd ,, (,, ,,) ... 3rd ,, (,, ,,) ...	2nd (Southern) Army Bde.	5th (Kent & Sussex) Bty. ... (B.L. 4·1″ How.) ... ... (Attached to 7th Bde. for administration and regular training.)	Brighton.	3rd (Indian) D.A.C.	Campbellpore.
Light Bdes.	7th (Kent & Sussex) Lt. Bde.... 1st Bty. (Q.F. 3·7″ How.) ... 2nd ,, (,, ,,) ... 3rd ,, (,, ,,) ...	4th (Kent & Sussex) Divl. Artillery.	7th (Kent & Sussex) Lt. Bty. (Q.F. 3·7″ How.) ... ... [Brigaded with 2nd (Eastern Counties) 4th (London) and 5th (London) batteries for administration, etc.]	Deepcut.	8th (Kent & Sussex) Mtn. Bty. ... ... [Brigaded with 45th, 46th and 47th Indian Mountain Batteries.]	Abbottabad
Medium Bdes.	7th (Kent & Sussex) Med. Bde. 1st Bty. (B.L. 6″ 26 cwt. How.) 2nd ,, (,, ,,) 3rd ,, (,, ,,) 4th ,, (,, ,,)	2nd Corps Artillery.	7th (Kent & Sussex) Med. Bty. (B.L. 6″ 26 cwt. How.) ... [Brigaded with 1st (Eastern Counties) 3rd (London) and 5th (London) Batteries for administration, etc.]	Longmoor.	8th (Kent & Sussex) Med. Bty. ... [Brigaded with 2nd (Eastern Counties) 4th (London) & 6th (London) Batteries.]	Ambala.
Heavy, A.A. & Coast Bdes.	4th (Kent & Sussex) A.A. Bde. 1st A.A. Bty. (Q.F. 3″ 20 cwt.) 2nd ,, (,, ,,)	2nd (Southern) Army Artillery.	8th (Kent & Sussex) A.A. Bty. (Q.F. 3″ 20 cwt.)	Blackdown.	7th (Kent & Sussex) A.A. Bty. ...	Quetta.
	8th (Kent & Sussex) Coast Bde.	Home Defence.	10th (Kent & Sussex) Coast Bty.	Dover.	11th (Kent & Sussex) Coast Bty. ...	Karachi.
5TH (THAMES) REGIMENT.						
R.H.A.	"E" Bde. ... ... 1st Bty. (Q.F. 3·3″ How.) ... 2nd ,, (,, ,,) ... 3rd ,, (,, ,,) ...	5th Cavy. Division.	Nil.	—	"E" (Thames) Bty. ... ... [Affiliated to "F" (Hants & Dorset) Bty. for relief.]	Risalpur
Field Bdes.	49th (Thames) Bde. ... ... 1st Bty. (Q.F. 18 pr.) ... ... 2nd ,, (,, ,,) ... ... 3rd ,, (,, ,,) ... ... 4th ,, (B.L. 4·1″ How.) ...					
	50th (Thames) Bde. ... ... 1st Bty. (Q.F. 18 pr.) ... ... 2nd ,, (,, ,,) ... ... 3rd ,, (,, ,,) ... ... 4th ,, (B.L. 4·1″ How.) ...	5th (Thames) Divl. Artillery.	9th (Thames) Bde. ... ... 1st Bty. (Q.F. 18 pr.) ... ... 2nd ,, (,, ,,) ... ... 3rd ,, (,, ,,) ... ... 4th ,, (B.L. 4·1″ How.) ...	Aldershot.	10th (Thames) Bde. 1st Battery ... 2nd Battery ... [Brigaded with 11th (Hants & Dorset) Brigade.]	Mhow.

(Note.—An asterisk after the number denotes regular personnel.)

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EXTRACT FROM ROYAL ARTILLERY REGIMENTAL LIST (BLUE LIST) FOR MAY 1942.

Summary of Batteries (Regular).

Regiment.	At Home.					Abroad.				
	R.H.A.	Field.	Light.	Medium.	Heavy A.A. and Coast.	R.H.A.	Field.	Light.	Medium.	Heavy A.A. and Coast.
1st (Eastern Counties) ...	—	5	1	1	3	1	2	1	1	3
2nd (London) ...	1	5	1	1	2	—	3*	1	1	2
3rd (London) ...	—	5	1	1	3	1	2	1	1	3
4th (Kent and Sussex) ...	1	5	1	1	2	—	3*	1	1	2
5th (Thames) ...	—	5	1	1	2	1	2	1	1	2
6th (Hants and Dorset) ...	1	5	1	1	3	—	3*	1	1	3
7th (Western Counties) ...	—	5	1	1	2	1	3*	1	1	2
8th (Severn) ...	1	5	1	1	3	—	2	1	1	3
9th (Welsh) ...	1	5	1	1	2	—	2	1	1	2
10th (Northern Counties) ...	—	5	1	1	3	1	3*	1	1	3
11th (Yorkshire) ...	—	5	1	1	3	1	3*	1	1	3
12th (Lancs. and Cheshire) ...	1	5	1	1	2	—	2	1	1	2
13th (North Midland) ...	1	5	1	1	3	—	3*	1	1	3
14th (South Midland) ...	—	5	1	1	2	1	2	1	1	2
15th (Highland) ...	—	5	1	1	2	1	2	1	1	2
16th (Lowland) ...	1	5	1	1	3	—	3*	1	1	3
Total ...	8	80	16	16	40	8	40	16	16	40

* Including Indian D.A.C's., shared with Regiments only showing 2 batteries.

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TRAINING THE HUNTER FOR POINT-TO-POINT RACES.

BY EQUINOX.

AN excellent and helpful article by "Pardon" appeared in the January number of the Journal (Vol. LV, No. 4, 1929) on the subject of racing and training the hunter. But there are some who feel that the recipient of "Pardon's" letter, however grateful for his help, perhaps did not get quite what he required. He asked for help in training a young horse and a charger for local point-to-points. He was sent some notes which included a diary of work which began with a mile canter on October 31st.

"Pardon" says that some of his notes refer to steeplechasing, and evidently did not intend his friend to treat the local point-to-points as if they were Foxhunters' Steeplechases; but many young subalterns have perhaps felt that the whole thing was beyond their scope; and it is to encourage the officer to hunt up to the last possible day, and still enjoy his race, that these notes are written.

There are many gunner stations where foxhunting is possible from barracks; and although in most cases the sport does not reach the standard set by the more fashionable packs, yet, even in most provincial countries, very good point-to-point races, and in some cases bonâ-fide meetings are held.

Let us assume our sportsman has hunted his horse three days a fortnight throughout November, December and January; that he has him fit and hard and in good condition on February 15th: let us take March 19th as the day of the brigade point-to-point; how should our sportsman proceed in order to distinguish himself?

First let us emphasize our assumptions. For if the horse has no condition on him the procedure must differ—we must get it on him: if our sportsman has been on leave all December and January and trusted to his groom to do his detailed exercise, he may return to a different proposition—a soft horse.

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Should the horse lack condition, nothing can be done until, by carefully supervised feeding and regulated exercise, he has got him right. Should he be soft, he must be worked slowly into fitness by walking and trotting exercise.

Our assumption being correct, the owner has four and a half weeks ahead of him and a hunting-fit horse. He is well on with his section training, and still wishes to hunt another day or two if he can. For four days, February 16th—19th, the horse is left in, given a course of salts and sloppy food, with perhaps a half-hour's exercise in hand the last day or two. There follows increasing exercise and food, so that on February 23rd he is eating, say, 13 lbs. oats with 16 lbs. hay, and walking 12—16 miles at exercise. He is alternately led out and ridden back with another horse, using different villages about seven miles away from barracks as exercising points. Most grooms have vague ideas of time and space.

After February 22nd or 23rd the work at exercise will include some slow jogging. There is no harm in hunting the horse a very short day, nor, if all is going well, need the owner worry about taking his horse on a drill-order or two, but the horse should not be out of his stable for more than four hours. But by February 27th he must consider the fitness of his horse's wind, and begin a little really fast work. For this there is no necessity to cut his hay, though it is unwise to gallop a horse with undigested hay to cramp the expansion of his lungs.

He must enter the horse for a preliminary point-to-point on, say, March 12th, and arrange his gallops somewhat as follows:—

	Feb. 27th	¾ mile.	½ speed.
	Mar. 1st	,,	,,
	,, 3rd	2 ,,	¾ ,,
	,, 5th	¾ ,,	¾ ,,
	,, 8th	½ ,,	½ ,,
To be done twice	,, 10th	3 furlongs	full speed
	,, 11th	3 ,,	,, ,,

The galloping track or field must be of good quality. Soft going on sand is better than harder going on grass. The horse should walk half an hour before his fast work, being led with loose girths just before he uses his wind and for a half a mile directly

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afterwards. For this reason the galloping field might well be two or three miles away from barracks. No other work will be done on these days. On the intermediate days two hours walking and jogging will be enough. Many consider a slow jog up a slight incline to be a useful preparation.

From February 20th onwards great care has been taken not to get the horse leg-weary and stale at exercise. His long road walks may be alternated with walking and trotting up and down and round a good sloping grass field (other than the galloping field) for an hour and a half. Nor must his appetite grow stale. The owner must see that he is doing well, and eating as much as he wants. He must know how much this is, and watch for signs of shyness from big feeds, which some horses will not face. Many horses do well at night.

On the 12th the horse runs in his preliminary race. If in good fettle the horse may do well—he is expected to. He should not be allowed to drop back, but be kept in the running and pulled up before the end should he be unable to get the course.

On the 13th he will rest and stretch his legs, on the 14th he will walk an hour or so; there remain four days before the big race. On two or three mornings he should do a short sprint to keep his wind clear. Any tendency to over-gallop or overwork him must be avoided. Provided he was right on the 12th he will go well on the 19th: if not, he cannot be put right in a week. There is one admitted danger in this preparatory race: it may leave the horse stiff in his muscles for the big day. With most horses this will not be so provided the foundation has been well laid. And one cannot begin to know a horse until his second season.

We advise our sportsman here to turn to the excellent notes by Major J. E. T. Younger in the October number of the Journal (Vol. LVI, No. 3, 1929), wherein he will find the principles of feeding and work applied to the winner of short races. Adjustment to the conditions of the hunter and his three-and-a-half mile course will give what is wanted in the present case. We will now deal with the preparation for jumping.

Assuming a hunter who steadies himself at his fences and jumps well from his hocks, it will be advisable, in the case of most modern

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point-to-point courses, to get him sharpened up a trifle over his fences.

A schooling fence should be found or built, very small, sloping away, and perhaps with a ditch in front.

Our owner should get the help of a friend or another horse to go on in front, and he should first get his horse going well into his snaffle and jumping well over the fence without checking or hesitation. If his horse is a little sticky, he should give him three sharp strokes with a whip or stick some few lengths away, and immediately retake a rein in each hand to ride his horse out over the fence, sitting as still as he can. A considerable amount of repetition may be necessary before this result is got, and of course in doing so it is most important not to get the horse disliking this work. When he goes freely over the fence, it may be well to get the leader to jump a trifle slower, the following horse going on and catching or passing the other over the fence. This work should be done between February 26th and March 5th, after which the horse should not be jumped again. The owner must note any tendency of his horse to jump left or right-handed, and whilst keeping him as straight as possible make no attempt to interfere, avoiding any idea of "retraining."

One thing which tends to worry the novice is the approach to the first fence of a point-to-point. If our beginner can get two others to ride knee-to-knee with him in his school, he will be less likely to be upset by a similar experience in his race. He must be prepared, in the race, to take his fences in very close company with others, avoiding the instinctive desire to pull back to get more room, thus upsetting his horse's balance and laying himself open to be crossed.

On the day of the race he may well give his horse a pipe-opener in the morning, letting him arrive at the course neither too early nor too late, and be kept warm. A hood is useful in shutting out the noise of the bookmakers from his horse's ears, which often makes them fidgety and fretful. The owner is advised to wear thin breeches and boots, but otherwise his ordinary hunting kit, with top-hat or black steeplechasing cap with shellac lining. His light hunting saddle is best if he can get the weight; otherwise he should have tested his racing saddle and the length of

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his leathers over his schooling fence. Two holes shorter than his shortest hunting length will do for his stirrups, the leathers of which, and of his girth straps, he must examine carefully beforehand. Should there be any risk of his saddle slipping back, he is well advised to use a breastplate, adjusted neither too loose nor tight enough to restrict his horse's shoulder action. Unless he has rubber reins, thin string or cotton gloves will be of service by the time his horse is sweating. A short trot and canter in the riding-school without stirrups before breakfast on the morning of the race will ensure that he feels at home in his saddle on mounting. New light shoes or racing plates should have been fitted to his horse the day before, care being taken to ascertain in sufficient time that the horse has not been pricked or pressed.

After changing, and weighing out with saddle, surcingle, weight cloth, number cloth, breastplate and martingale, but without whip, he should arrange the lead in the cloth to carry in front of and behind the girth, mostly in front, and equal on each side. Should he have weighed out with no margin to spare, a half-pound of lead may be put in his coat pocket. He should help his groom saddle up, see that the number-cloth is on and the weight cloth well disposed; mount, test the length of his leathers, girth up from on top, dismount, put on the surcingle, and have the horse rugged and walked about again. When he sees that he is about to be ordered to mount, his groom should give his horse a mouthful of water from a bottle to freshen him, and sponge his eyes and nose.

At the start, unless there is a special reason, he should bear in mind that his horse, not he, has to run the race, and avoid trying to be first or last over the first fence. He should try rather to keep his horse balanced and arrive at the fence in the most natural position in the field of runners, relying on his schools to take it in confidence knee to knee with others. Unless he is sure that the leaders are making too much or too little running he should lie about third, but without sacrificing the even pace of his horse to position for its own sake. He may let the leaders leave him a shade across the fields, and by riding strongly but quietly to his fences regain this length or two in jumping them. Uppermost in his mind should be stillness, evenness and a determination to go the shortest way.

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BE READY TO TAKE YOUR FENCES KNEE TO KNEE.

First fence of the Duke of Beaufort's Lightweight Subscriber's Race at Hazleton. The Winner was 'Theodora' (3).

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On nearing home he must note whether the leaders are jumping sideways, and be prepared to pass them possibly at a fence. He must sit steadily over his fences, and remember that on this occasion a job in the mouth is better than a peck.

Having walked the course beforehand, he should put fences out of his mind, and keep his attention on the running of his horse and those in front and, towards the end, behind. His final spurt must be made by turning the tap on slowly, not jerkily, carefully judging the moment and quantity which will bring him to the front neither too early nor too late.

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"HE DREAMED A DREAM."

BY "THE OLD COLONEL."

THE old Colonel sank into his comfortable chair. He had dined well and was feeling extremely pleased with life in general and with himself in particular. It was mid-winter and the fire was pleasantly warm. His face was burning from exposure to the cold wind, for he had spent the day in the hunting field. He had really enjoyed himself, his horses had gone well and the hounds did not run too fast for him. The various short cuts he had taken, which were fully justified by his increasing years, had always been successful and he could honestly claim to have seen most of a long hunting run which had ended in a stout fox being marked to ground. A dog hound he had walked two years before was always well up and sometimes actually leading the pack. No wonder then that this gallant old man felt pleased with life! The good dinner, the warm room and the effects of weather and exercise, combined to make him drowsy. Thinking over the day's sport, he dropped gently off to sleep and dreamed a dream.

How real it was. He was driving in a dog cart along a rather muddy road in the country. As he went, his eye naturally took stock of the fields and fences on either side of him. It was a grass country and the fences were mainly walls of loose stones. There were also banks with straggly growth on them and rough fences with an occasional rail—a fair hunting country. It was winter and his roving eye soon noticed the plain black toes of his boots peeping out from under the driving rug. Hunting boots to be sure. Well, there was no bootmaker like X, and these boots had been particularly successful! Soon he passed some horses on the road going on to the meet, jogging along at the approved pace. As he passed them he noticed his two. How well they looked—then no one ever had such a groom as Morris. He lived for his horses and he had two to be proud of. The led horse was a chestnut mare about 16 hands, of the very highest quality, a real galloping sort with a snaffle mouth. It wasn't everyone who could ride her and if that mouth was interfered with during the first

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two or three fields after hounds found anything might happen. Morris himself was riding a bay horse only about 15·2 hands, a sturdy deep horse with great limbs and a head showing that his breeding was alright, a rare sort easy to ride, a tremendous jumper and, if not exactly a racehorse, by no means slow. Soon he reached a four-cross road with a nice open space of grass, where hounds were meeting. Hunting people were arriving from all directions, either on horseback or in traps or carriages. Some he knew, others he didn't, but there was the usual cheerful air about everyone which is always so noticeable at a meet of the hounds.

Hardly had he got out of his trap before a rate and "ware horse" behind him proclaimed the arrival of the pack. There are some people who hardly notice the hounds but our old friend had been a hound lover all his life. Instinctively he observed, in a few short seconds, that it was the lady pack, that it contained a smattering, say one in five, of the rough-coated light-coloured hounds one associates with Welsh blood, while the remainder were an even looking lot with a good deal of black about them, lean, eager and very healthy in appearance. Taken as a whole he summed them up as most workmanlike, though perhaps a shade lighter in bone than the modern accepted type. From the hounds his gaze naturally passed to the hunt servants and their horses. They looked every bit as good as the hounds. The huntsman was riding a flea-bitten grey with a short tail, a well-bred active looking mare and both whips were well mounted on stocky, well ribbed up horses. The three men were all of that small active alert type who make the best hunt servants. The turn-out of horses, saddlery and of the men themselves was beyond reproach; he said to himself "a jolly good show".

Pulling out his watch our friend found it was five minutes to eleven and hastily went over to his own horses. To his groom he said "Well, Morris, which shall I take first?" knowing so well the answer he would get. "Please yourself, Sir". Not much help!! Turning to a hard looking middle aged man he asked "Are we likely to be in the woods to-day, Sir?" and received by way of reply "Not this morning anyhow, I hope—I expect we shall go to the long wood on Hangar Down first and it will be bad luck if we do not get a gallop from there. You will want

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your best horse for that" !, he added with a grin. That decided our friend and turning to Morris he said "I will take the chestnut first", and in two minutes was in the saddle. He was hardly there before the huntsman's cheery whistle and cry of "hounds please" proclaimed a move and off they set at a hunting jog. Chance brought our sportsman alongside the hard bitten man who suddenly jerked out "Look here my lad, if we find in the long wood, do not forget the sunk road all along the south side of it. Don't try and jump out of it on that side because you can't." Without waiting for a polite thank you, the hard bitten man pushed on to speak to somebody else.

Jogging along on his mare, our sportsman noticed how well he felt. What a comfortable ride she was, trotting along so lightly with an occasional snatch at her snaffle. Of course he was young—hadn't the hard looking man called him "My lad"? All the pains and stiffness from which he usually suffered were gone. The pain in his right knee from that nasty fall on the polo ground years ago at Ghezira and which had always bothered him when he rode, had vanished. The numb feeling in his right arm and hand from a bullet wound had disappeared. Even the ever-ready drop at the end of his nose and the tendency of his eyes to water in the winter wind were absent.

Very soon they turned into a field and he was able to give his mare the longed-for canter during which she gave one or two quite useful pig jumps. After that she would settle down for the rest of the day. The first cover, a withy bed, was blank and off they trotted up a country lane to the ridge of a long stretch of downs. On the top was a great patch of woodland, perhaps a mile long, but from the way they were coming at it, it was impossible to gauge its width. Hounds were put in at once at one end and our friend, wishing to get an idea of the extent of the woodland, followed the huntsman with three or four of the field into it. Jogging up a ride he soon saw that at this end it was little more than 200 yards in width.

The huntsman began to draw steadily up the strip of cover and it was not long before a hound threw her tongue. Almost immediately, from in front, there came the welcome "Tally Ho over" and the whole woodland to his right seemed to burst into

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hound music. Our friend now followed the bustling huntsman to a cross ride, arriving there just in time to see the hounds crash over it on his right. Following the huntsman again, after three or four hundred yards he came to another cross ride, in time to see the pack, in full cry, disappear from view over the low wall which formed the southern boundary of the cover about 100 yards away to his right. That is evidently the way out, thought he, as he turned his mare towards the wall. Bounding along with her powerful stride, she was soon committed to the fence and it was only as she took off that her rider realized, with a sickening feeling of horror, that he was jumping out into the sunken road. While in the air the words of warning of the hard looking man flashed through his mind, too late. Instinct made him lean back as far as possible, until he felt the mare's quarters bump his shoulder blades. Then she landed, slithering and skating on the steep sides of a cutting. Had the road at the bottom of it been dry, nothing could have saved her, but, as it was wet and slippery, she shot across it on her nose and her knees, just saving a head-on collision with the opposite bank by heaving herself round to the left as she got there. This sudden jink was too much for her rider who went straight on, crashing into the steep grass wall. Though shaken, he was on his feet in a moment. A rapid glance at the mare showed that there was nothing worse than mud on her knees and he was in the saddle again in a second, with little damage to himself but a very considerable amount to his hat.

Trotting up the sunk road for fifty yards, he found an exit, and so passed out into a large grass field. A brief pause to listen and he was convinced that hounds were below him and running in the open country well clear of the wood. Cantering across the field he was soon over the low stone wall and in the next one. Then he saw the pack running below him along the next fence, but not left-handed as he had expected. They had swung round and were going to his right. Turning himself in the same direction, he negotiated a low rail and found himself abreast of the hounds and about 200 yards to their right and above them. The scent was good, the going perfect and the fences always jumpable. He was therefore able to maintain this position for more than a mile along the ridge of downland. Gradually,

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however, the hounds began to turn away to the left and to sink the hill. This made things more difficult for him, the fences all seemed to run up and down the hill or across the face of it. To ride aslant down it therefore meant coming at them at a very awkward angle. It seemed better to keep straight on and hope that the fox had not gone into the valley. These hopes were rapidly dissipated, as the music of the pack, which was now out of sight, was growing fainter and fainter.

At last he saw them again, running along the bottom of the valley. What should he do? Rapidly he summed up the situation. As long as they remained in the valley, they might turn again up on to his side and he would be well placed. If, however, they turned up the opposite slope he must do his best to cross the valley at once and catch them. At that very moment they turned up the hill opposite. Muttering an oath our hero swung his horse immediately to the left and galloped down the grassy slope. The very first obstacle was a nasty one, a high wall and no doubt the deuce of a drop on the far side. He had already had quite enough of big drops. Just then his attention was drawn to a shout on the hill across the valley, followed by the barking of a dog. Looking up he saw plainly a man waving his hat and below him a small brown object being chased by a larger one down the hill. The smaller object was obviously the hunted fox. Headed and worried by the cur he had turned back again and was dropping into the valley.

Now what would happen? Would the hounds check on the opposite hill? Ought he to cross over to try to cheer them on? They would check long before he could get there. Better to wait and see. The big brown speck had stopped, the little one was rapidly sinking the hill and the hounds, cheered on by the yokel, had taken up the line and were running at a tremendous pace. If he kept on in his original direction, our friend and the fox should meet at a point about a mile ahead. On then . . . . The going was easy along the springy turf over the walls, and five minutes later a pause to listen.

Turning round, he realised for the first time that he was alone with hounds. Rapidly reasoning it out, he diagnosed rightly that the whole field had gone on to the end of the long cover fully

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expecting to meet the hounds at the top of it, but the fox having turned in the opposite direction it was clear that while hounds were running in one direction the field was galloping in the other. At the end of a few minutes there would be a very big gap between them, but no time to think of this. He was in luck and could hear them coming his way. Jogging along, he came out into a lane and peering over the straggling hedge on the far side viewed the fox going strong and breasting the hill. A moment later the pack appeared in full cry ! Galloping along the soft lane he passed over the brow and started to sink the hill. Then, as the pack was bearing away to his left, he was compelled to leave the lane.

For two miles away below stretched the cream of the vale and they were heading straight for it. On they went over the grass, rattling down hill at a tremendous pace, each field getting a little deeper than the last and the fences bigger and more difficult. Soon the hounds crashed into a spinney and our friend turned in through a bridle gate. Hurrying down a ride, at first wide and then getting more and more narrow, he was soon unable to force his way on owing to the thick undergrowth. What cursed luck ! Back again to try another ride. All this took time and when he paused a moment to listen he could hear nothing. Realising hounds must be out of the wood, he galloped on. For the first time now he noticed that his mare was not going so well, and with a sickening feeling he realised that for them the hunt was probably over. If only he could find his second horse. Hardly had the wish formulated before he heard shouts and hurrying towards them came up with some second horsemen. There, sure enough, was the faithful Morris, and it was only a matter of moments before he was safely in the saddle of the little stocky horse and was following the line hounds had taken "hardly a minute before."

What a horse he was. Through the dirt, over the banks, often rough, treacherous, slippery and overgrown, all were the same to him. Soon he was with hounds but was hard pressed to "live with them". What a pace they went, on and on over the vale. The ecstatic minutes were slipping by. Surely it could not last much longer. Jumping into a big field he viewed the fox on the far side, struggling along with dragging brush, his back up and tongue hanging out. Raising his battered hat and pushing on at the

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utmost speed, our hero cheered on the hounds. Over the next fence they tore, closing on the fox at every stride and running into him in the open only a few yards short of a large cover. Jumping from his horse he ran into the pack, laying about him with his whip. Somehow he cleared a ring.

The dead fox lay between his feet with the hounds baying and growling all round him. He felt he absolutely must save some part of that fox as a trophy, but how? He never carried anything bigger than a small penknife. What could he do with that? Wondering he looked at the fox. Good God, it was staring at him ! ! The awful paralysis which sometimes comes in nightmares seized him. He couldn't move and the fox was stealing towards him ! Sweating with fear, the thought ran through our sportsman's mind—"I have had my fun at his expense. Now he will have his at mine".

Now he was staring right into his eyes. Oddly enough they didn't look unkind, but rather loving and gentle. Then he seemed to spring, but instead of being torn by those long white fangs all that he felt was a licking tongue and he woke with a start to find that his favourite terrier, frightened no doubt by his groans and contortions, had sprung into his lap and was licking his face ! With a desperate sigh of relief the old Colonel patted the dog.

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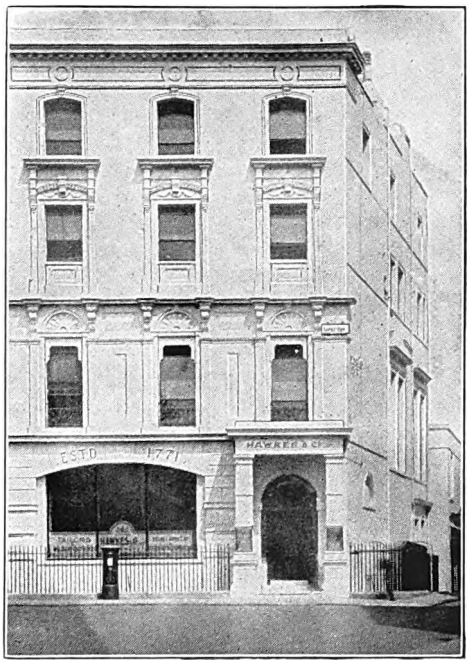

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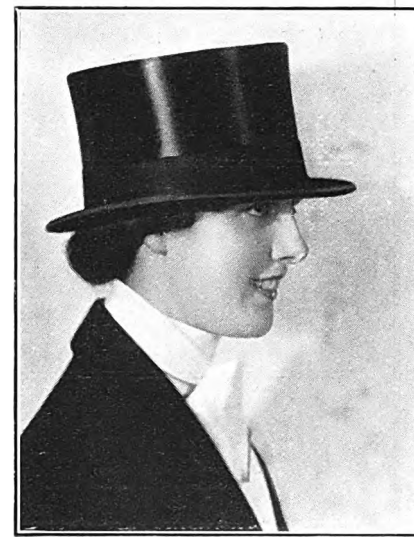

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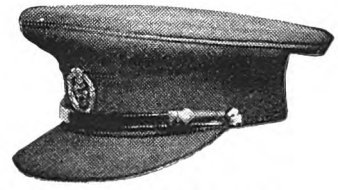

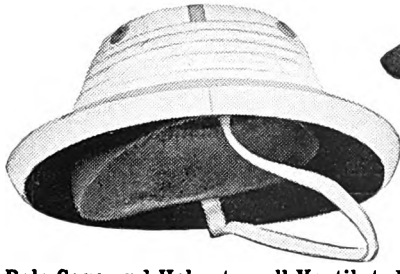

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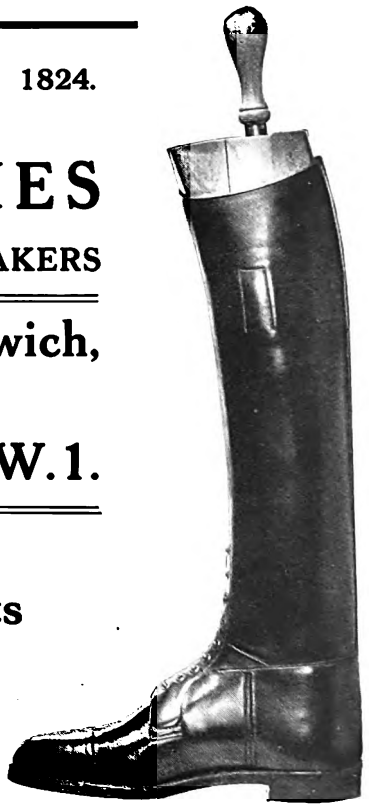

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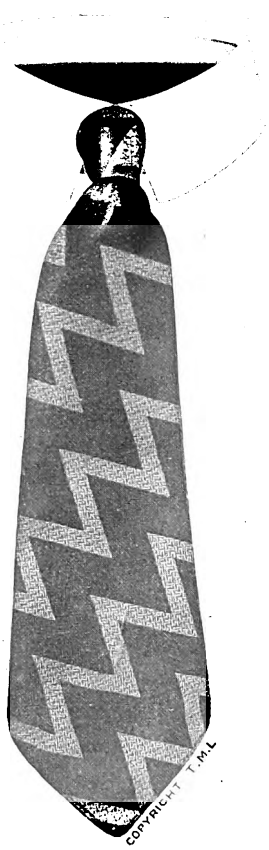

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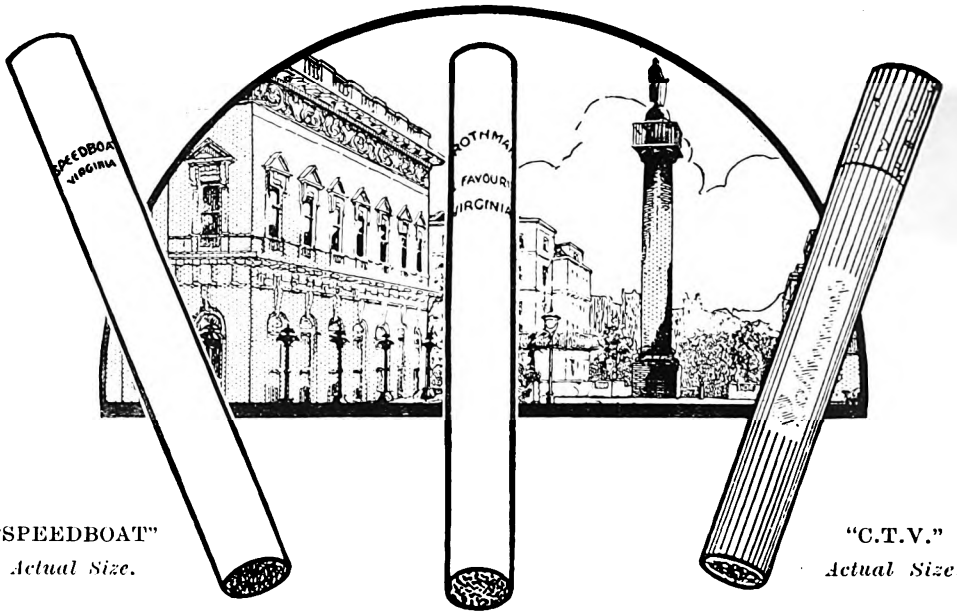

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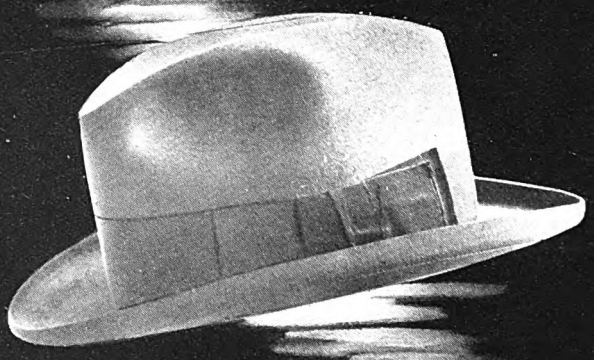

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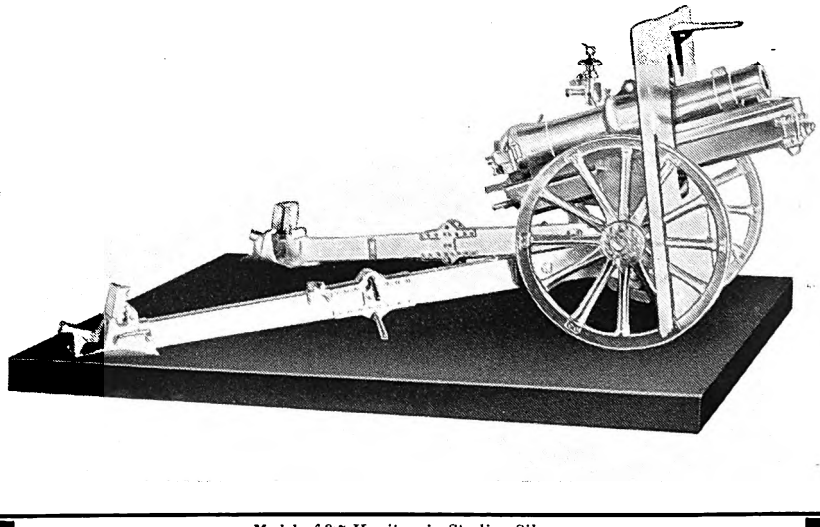

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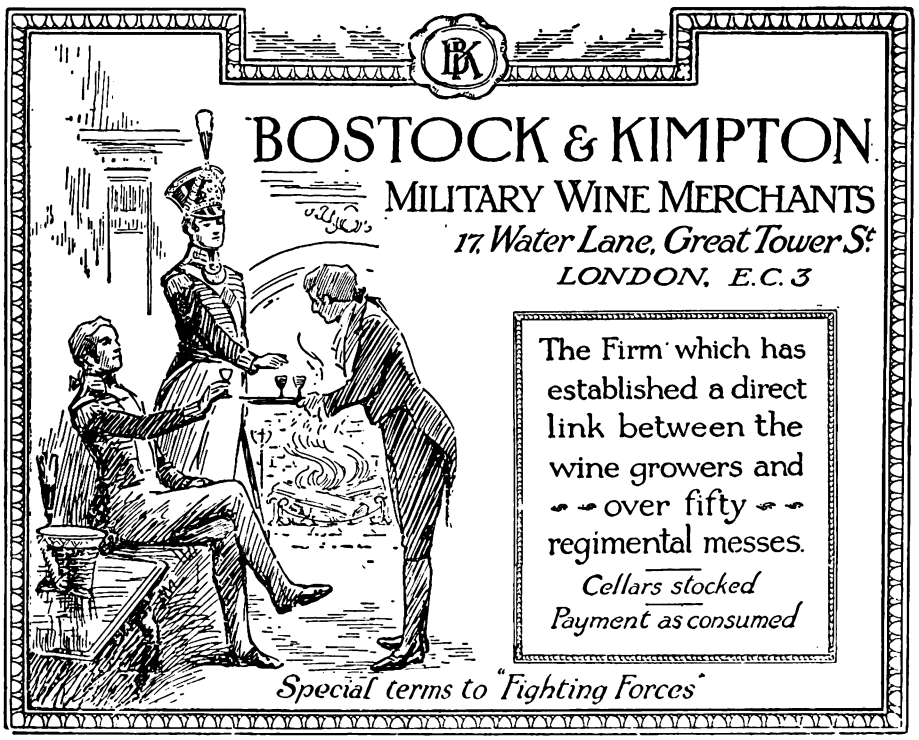
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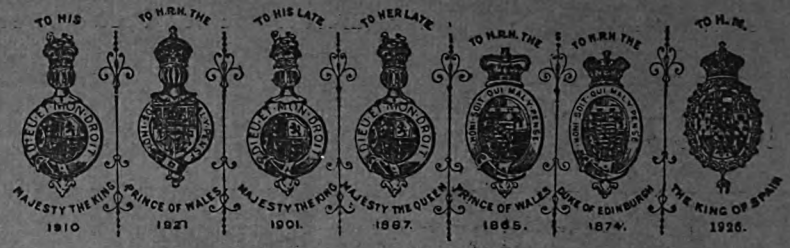

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